83321400

CONTROL DATA

CDC® END USER SUBSYSTEMS

33332/33302
38302/38304
33801/3350X
38800/33800

GENERAL INFORMATION
STORAGE CONTROL INSTALLATION
CONTROLLER/DRIVE INSTALLATION

INSTALLATION MANUAL

REVISION RECORD

REVISION	DESCRIPTION
01	Preliminary edition.
A (9-13-77)	Manual released. This edition obsoletes all previous editions.
B (1-12-78)	Miscellaneous technical and editorial changes.
C (4-26-78)	Add information concerning 38302 (2 x 3350) and miscellaneous technical and editorial changes.
D (7-11-78)	Miscellaneous technical and editorial changes.
E (7-15-79)	Add information on 33502 and Dual Access Feature. Delete information on 33802 and 3330-1 models. Revised addressing charts. Add appendix providing sample addressing methods. Manual completely rewritten. This edition obsoletes all previous editions.
F (10-26-79)	Miscellaneous technical and editorial changes. Add references to MF112 and MF113 Inline Diagnostics.
G (3-20-80)	Add Appendixes B and C. Add information on Bit 6 jumper. Miscellaneous technical and editorial changes. This edition obsoletes all previous editions.
H (11-20-80)	Add information on 38304 (FA113) Dual Storage Control. Miscellaneous technical and editorial changes. This edition obsoletes all previous editions.

REVISION LETTERS I, O, Q AND X ARE NOT USED.

By Control Data Corporation
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5950 Clearwater Drive
Minnetonka, MN 55343

or use Comment Sheet in the back of this manual.

REVISION RECORD (Contd)

REVISION	DESCRIPTION
J (3-3-81)	Integrate information on sequential addressing. Miscellaneous technical and editorial changes.
K (6-18-81)	Miscellaneous technical and editorial changes.
L (2-1-82)	Add information currently contained in CDC 33302 Disk Memory Subsystem Installation Manual (Pub No. 83301600), which is now obsoleted. Incorporate installation procedures of FMDs that were in section 1 of their respective Maintenance Manuals, volume 1. Add information on revised sequential addressing techniques and new FMDs with Dual Volume Reserve/Release Option. Manual completely reorganized to provide installation procedures in standalone groups of information. This edition obsoletes all previous editions.
M (5-10-82)	Miscellaneous technical and editorial corrections. Change controller addressing procedures per DVRR FMD ECO DH02470.
N (10-22-82)	Add changes to startup and checkout procedures. Incorporate FA113 ECO DH05051. Miscellaneous technical and editorial changes.
P (3-7-83)	Add new startup and checkout procedures. Miscellaneous technical and editorial changes.
R (6-3-83)	Add information on 38800 (FA161) Storage Control.
S (1-17-84)	Update manual to incorporate ECOs DJ17049, DJ17050, DJ17154, DJ18008A, DJ18009A, DJ18010, DJ18011, and FCOs DJ18009 and DJ18011. Revise section 2D to add FA163 information. Add section 4E (DSU/HSC). Technical and editorial changes.
T (6-20-84)	Update manual to incorporate ECOs DJ18013, DJ18014 and DJ18015. Section 4E updated and revised. Technical and editorial change.
U (10-4-84)	Update manual to incorporate ECOs DJ16368, DJ18017, DJ18020; FCOs DJ18015 and DJ18020. Technical and editorial changes.

REVISION RECORD (Contd)

REVISION	DESCRIPTION
V (03-18-88)	Incorporate installation information previously available only in preliminary form. Renumber all front matter from Roman numerals to f- numbers. Miscellaneous technical and editorial changes.

LIST OF EFFECTIVE PAGES

This manual is at revision V. Each page in your manual should be at the revision level listed below. The "Div" is a colored divider page.

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PREFACE

INTRODUCTION

This manual has been prepared for customer engineers and other technical personnel directly involved with the installation and checkout of CDC® end user Disk Memory Subsystems. You should be thoroughly familiar with the principles of operation and programming of the IBM block multiplexer and selector channels.

Abbreviations are listed on page f-45.

SUBSYSTEM COMPONENTS

The subsystem product numbers (3330X, 3350X, etc.) used throughout this manual are applicable to the end-user market. These subsystems are also available to Original Equipment Manufacturers (OEM) under other product designations. The chart on the next page lists the basic correlation between end-user and OEM products. The chart does not list all variations in product/equipment numbers.

The CDC 33800 and CDC 895 Disk Storage Subsystems are physically identical. However, the 33800 is used with IBM systems and the 895 is used with CDC CYBER systems. Therefore, any internal references in this manual pertaining to SOLEX, EREP, and OLTEP apply only to a 33800 subsystem used with an IBM mainframe.

In general, all information in this manual applies also to OEM subsystems. Be aware, however, that specific OEM sites may require special procedures. Contact your analyst or site planning personnel for any variations to these procedures.

END USER VS OEM PRODUCTS

UNIT	END USER		OEM	
	Product	Equipment	Product	Equipment
Storage Control	38302	FA721	9086	FA7A9
	38302	FA109	9088	FA7B2/FA7B3
	38304	FA113	9079	FA1A2
	38800-1	FA161	None	-----
	38800-3	FA163	90880-3	FA1A3/FA1B2
Controller Adapter	33332	FV605	9087	FV1B2
HPD	3330X	BRXXX	9786	BR3D9
FMD	33801/3350X	BZXXX	9776	BZXXX
HSC	33800	FV716	90380	FA7A5
DSU	33800	BZ640	97380	BZ8G1/BZ8H1

MANUAL ORGANIZATION

The information in this manual is organized into the following major subject headings:

- Section 1: General Information -- contains a general description of End-User subsystems, equipment setup, and microprogram availability.
- Section 2: CDC Storage Control Installation -- contains a listing of storage control model numbers and an installation check list.

- Section 2A: FA721 Storage Control Installation -- describes the procedures required to install and check out the FA721 Storage Control.

- Section 2B: CDC FA109 Storage Control Installation -- describes the procedures required to install and check out the FA109 Storage Control.

- Section 2C: CDC FA113 Dual Storage Control Installation -- describes the procedures required to install and check out the FA113 Dual Storage Control.

- Section 2D: CDC FA161/163 Storage Control Installation -- describes the procedures required to install and check out the FA161/163 Storage Control.

- Section 3: IBM Storage Control Installation -- describes the procedures required to integrate an IBM 3830-2 or Integrated storage control (ISC) into a CDC Disk Storage subsystem.

- Section 4: CDC Controller/Drive Installation -- contains a listing of controller and drive model numbers and an installation check list.

- Section 4A: CAU/HPD Installation -- describes the procedures required to install the CDC CAU (33332) controller and CDC HPD (3330-11) drive.

- Section 4B: Non-DAF Capable FMC/FMD Installation -- describes the procedures required to install CDC Non-DAF capable Fixed Module Controller (FMCs) and Fixed Module Drives (FMDs).

- Section 4C: DAF Capable FMC/FMD Installation (without DVRR) -- describes the procedures required to install DAF capable Fixed Module Controllers (FMCs) and Fixed Module Drive (FMDs) on subsystem <u>not</u> equipped with the Dual Volume Receive/Release (DVRR) feature.

- Section 4D: DAF Capable FMC/FMD Installation (with DVRR) -- describes the procedures required to install DAF capable Fixed Module Controllers (FMCs) and Fixed Module Drives (FMDs) on subsystems equipped with the Dual Volume Reserve/Release DVRR feature.

- Section 4E: HSC/DSU Installation -- describes the procedures required to install the CDC HSC Head of String Controller and CDC Disk Storage Unit drive.

- Appendix A: CDC Equipment Detailed Addressing Procedure -- provides detailed information on addressing for a subsystem consisting exclusively of CDC equipment.

OTHER MANUALS

The following manuals are recommended for those seeking supplementary information on the subsystem and the units comprising the subsystem:

NOTE

Manual titles are abbreviated. Refer to sections 2 (storage control) and 4 (drives) for exact unit equipment identifiers.

Publication No.	Title
	GENERAL
83322440	CDC Microcircuits Volume 1 (IC data sheets classified by 3-digit CDC element identifiers, plus general information on logic families and an explanation of IC symbology)
83324400	CDC Microcircuits Volume 2 (Data sheets for those ICs that are identified on logic diagrams by their industry-recognized vendor type numbers)
83324020	CDC Microprogram Trace Device (MTD) Hardware Maintenance Manual. This manual cannot be ordered; one is supplied with each MTD unit.
	HPD SUBSYSTEM (3330X)
83301500	Reference Manual.
22241700	SOLEX User Guide, Vol. 1
60468920	SOLEX User Guide, Vol. 2
60465350	SOLEX User Guide, Vol. 3
83301700	Subsystem Troubleshooting Manual, Vol. 1 (Inline Diagnostics, Operation Procedures, and Error Dictionary)

HPD SUBSYSTEM (3330X) (Contd)

83316700	Subsystem Troubleshooting Manual, Vol. 2 (Inline Diagnostic Flowcharts)

FMD SUBSYSTEM (33801/3350X)

83321500	Reference Manual
22241700	SOLEX User Guide, Vol. 1
60468920	SOLEX User Guide, Vol. 2
60465350	SOLEX User Guide, Vol. 3
83321600	Troubleshooting Manual Vol. 1 (non-DAF)
83323100	Troubleshooting Manual Vol. 1 (DAF without DVRR)
83337240	Troubleshooting Manual Vol. 1 (DAF with DVRR)
83321700	Troubleshooting Manual Vol. 2 (Inline Diagnostic Flowcharts)
83322630	User Analyst Guide
83322210	General Information Manual

DSU SUBSYSTEM (38800/33800)

22241700	SOLEX User Guide, Vol. 1
60468920	SOLEX User Guide, Vol. 2
60465350	SOLEX User Guide, Vol. 3
60467070	38800-X Series Disk Subsystem Maintenance Overview/Guide (Introduction, Troubleshooting Directory, System Diagnostics, Fault Identification)
60467260	CDC 38800-1 Disk Storage Subsystem Reference Manual (General, Description, Operation, Programming)

FA721 STORAGE CONTROL

83301800	Hardware Reference Manual
83301900	Models A thru M Hardware Maintenance Manual, Vol. 1 (Preventive/ Corrective Maintenance and Wire Lists)
83302000	Models A thru M Hardware Maintenance Manual, Vol. 2 (Diagrams)
83321900	Models N thru U Hardware Maintenance Manual, Vol. 1 (Preventive/ Corrective Maintenance and Wire Lists)
83302000	Models N thru U Hardware Maintenance Manual, Vol. 2 (Diagrams)
83322290	Troubleshooting Manual
83306000	Hardware Maintenance Manual, Vol. 3 (Parts Data)

FA109 STORAGE CONTROL

83321800	Hardware Reference Manual
83322470	Hardware Maintenance Manual, Vol. 1 (Preventive/Corrective Maintenance, Wire Lists)
83322480	Hardware Maintenance Manual, Vol. 2 (Logic Diagrams)
83306000	Hardware Maintenance Manual, Vol. 3 (Parts Data)
83322290	Troubleshooting Manual

FA113 DUAL STORAGE CONTROL

83321800	Hardware Reference Manual
83324140	Hardware Maintenance Manual, Vol 1 (Preventive/Corrective Maintenance, Wire Lists)
83324150	Hardware Maintenance Manual, Vol 2 (Logic Diagrams)

83324160	Hardware Maintenance Manual, Vol 3 (Parts Data)
83324170	MF118 Troubleshooting Manual (Standalone Diagnostics for FA113)

FA161/162/163 STORAGE CONTROL

83324380	Hardware Reference Manual
83324390	Hardware Maintenance Manual (Maintenance, Parts Data, Diagrams)
83324410	Hardware Diagnostic Reference (descriptions and operating procedures for storage control microdiagnostics used with the MF1xx microprogram.)
83324420	Troubleshooting Guide, Volume 1 (error code listings and card replacement information.) This manual is used in conjunction with 83324410 and contains information on error codes 000 through 130.
83337580	Troubleshooting Guide, Volume 2. This manual is a continuation of Volume 1 and contains information on error codes 410 and above.
83337310	Operator Manual (in English)
83337320	Operator Manual (in German)

FV605 CONTROLLER ADAPTER UNIT

83306100	Hardware Reference Manual
83306200	Models A and B Hardware Maintenance Manual, Vol. 1 (Preventive/Corrective Maintenance, Diagrams, Wire Lists)
83315400	Models D-J Hardware Maintenance Manual, Vol. 1 (Preventive/Corrective Maintenance, Diagrams, Wire Lists)
83306300	Models A-J Hardware Maintenance Manual, Vol. 2 (Parts Data)

FV605 CONTROLLER ADAPTER UNIT (Contd)

83320900	Models K-N Hardware Maintenance Manual, Vol. 1 (Preventive/Corrective Maintenance, Diagrams, Wire Lists)
83321000	Models K-N Hardware Maintenance Manual, Vol. 2 (Parts Data)

FV716 HEAD OF STRING CONTROLLER

83337500	Hardware Reference Manual
83337510	Hardware Maintenance Manual (Maintenance, Parts Data, Diagrams)
83337530	Hardware Diagnostic Reference Manual. This manual contains descriptions and operating procedures for HSC/DSU inline microdiagnostics used with the MF1xx microprogram.
83337540	Troubleshooting Guide. This manual contains error codes listings and card replacement information. (Used in conjunction with 83337530.)
83337560	Operator Manual (in English)
83337570	Operator Manual (in German)

HIGH PERFORMANCE DRIVES

70629200	BR501/503 Hardware Reference Manual
70629300	BR501/503 Hardware Maintenance Manual, Vol. 1 (Preventive/Corrective Maintenance, Diagrams, Wire Lists)
70629400	BR501/503 Hardware Maintenance Manual, Vol. 2 (Parts Data)
83302700	BR502/504 Hardware Reference Manual
83302600	BR502/504 Hardware Maintenance Manual, Vol. 1 (Preventive/Corrective Maintenance, Diagrams, Wire Lists)

HIGH PERFORMANCE DRIVES (Contd)

83302800	BR502/504 Hardware Maintenance Manual, Vol. 2 (Parts Data)
83319900	BR306/307/310/311 Hardware Reference Manual
83320000	BR306/307/310/311 Hardware Maintenance Manual, Vol. 1 (Preventive/ Corrective Maintenance)
83308900	BR306 Models A/B/D/E/F/G BR307 Models A/B/D/E/ Hardware Maintenance Manual, Vol. 2 (Parts Data)
83320200	BR306 Models D/E, BR310 Models A/B, Hardware Maintenance Manual, Vol. 3 (Diagrams)
83320100	BR306 Models A/B/F/G, Hardware Maintenance Manual, Vol. 3 (Diagrams)
83314800	BR310 Models A/B/C/D; BR311 Models A/B, Hardware Maintenance Manual, Vol. 2 (Parts Data)
83320400	BR307 Models D/E, BR310 Models C/D, BR311 Models A/B, Hardware Maintenance Manual, Vol. 3 (Diagrams)
83319700	Selector Channel Software Users Guide (STO 68602)

NON-DAF CAPABLE FMD

83322580	Hardware Reference Manual (controller)
83322610	Hardware Reference Manual (device)
83322560	Hardware Maintenance Manual, Vol. 1 (Installation and Checkout, Preventive/Corrective Maintenance, Parts Data for A2 units)
83322590	Hardware Maintenance Manual, Vol. 1 (Installation and Checkout, Preventive/Corrective Maintenance, Parts Data for B2 units)

NON-DAF CAPABLE FMD (Contd)

83322570	Hardware Maintenance Manual, Vol. 2 (Logic Diagrams, Wire Lists for A2 units)
83322600	BZ701/702/706 Hardware Maintenance Manual, Vol. 2 (Logic Diagrams, Wire Lists for B2 units)

DAF CAPABLE FMD

83323050	Controller Hardware Reference Manual
83323060	Device Hardware Reference Manual
83323070	Hardware Maintenance Manual, Vol. 1 (Preventive/Corrective Maintenance, Parts Data) (Series Code 26 and below)
83324520	Hardware Maintenance Manual, Vol. 1 (Preventive/Corrective Maintenance, Parts Data) (Series Code 27 and above)
83323080	Hardware Maintenance Manual, Vol. 2 (Controller Logic Diagrams For Units Without DVRR)
83337210	Hardware Maintenance Manual, Vol. 2 (Controller Logic Diagrams For Units With DVRR)
83323090	Hardware Maintenance Manual, Vol. 3 (Device Logic Diagrams)

BZ640 DISK STORAGE UNIT

83337440	Hardware Reference Manual
83337450	Hardware Maintenance (Maintenance, Parts Data, Diagrams)
83337530	Hardware Diagnostic Reference Manual. This manual contains descriptions and operating procedures for HSC/DSU inline microdiagnostics used with the MF1xx microprogram.

83337540	Troubleshooting Guide. This manual contains error codes listings and card replacement information. (Used in conjunction with 83337530.)

MICROPROGRAM MANUALS

Section 1 contains a table listing available disks. The manuals listed below contain printouts of the various microcodes. This list is in disk part number order. Printouts of the inline microdiagnostics are not available; refer to volume 2 of the applicable subsystem troubleshooting manual for flowcharts of inline microdiagnostic execution.

DISK NO.	PUB. NO.	TITLE
473861XX	83323690	MF110 Functional
728800XX	83324210	MF119 Functional
728822XX	83324180	MF120 Functional
728832XX	83324280	MF122 Functional
728864XX	83337220	MF127 Functional
728865XX	83337230	MF128 Functional
731597XX	83324270	MF118/MF123 Standalones
736867XX	83312100	FA721/FA109 Standalones
736984XX	83302100	8-Volume Functional
751267XX	83323010	MF105 Functional
77465410	83314400	MF111 Functional
778296XX	83319800	System 360/65 Functional
823226XX	83322330	MF109 Non-DAF Functional
823816XX	83323460	MF109 DAF Functional
832731XX	83322800	MF104 Functional

On computer sites complying with VDE requirements, installation and maintenance must be performed only by qualified service personnel using designated CDC/MPI parts. All replacement power cords must be VDE certified or harmonized.

If there is an emergency, all units connected to the computer can be turned off by pulling the round red EMERGENCY PULL switch on the IBM console. Remove power only from the subsystem by pressing the POWER OFF switch on the storage control.

In Rechenzentren, die VDE Vorschriften unterliegen, duerfen Installation und Wartung nur von qualifiziertem Wartungspersonal ausgefuehrt werden. Dabei muessen original CDC/MPI Teile verwendet werden. Alle Ersatz-Stromkabel muessen das VDE Guetezeichen tragen oder dieser Qualitaet entsprechen.

In Notfaellen koennen alle Geraete, die mit der Zentraleinheit verbunden sind, durch Ziehen des runden, roten EMERGENCY PULL (Not Aus) Schalters an der IBM-Konsole ausgeschaltet werden. Eine nur fuer das Plattenspeichersystem bestimmte Unterbrechung des Stromnetzes wird durch druecken des LOGIC 0 Schalters an der Speichersteuerungseinheit ermoeglicht.

CONTENTS

FIGURES

TABLES

ABBREVIATIONS

BIB	Bus In Bit
BLK	Black
BOB	Bus Out Bit
BRN	Brown
CPU	Central Processing Unit
CTL	Control (interface)
CU	Control Unit
DAF	Dual Access Feature
DCC	Device to Controller Connection
DDC	Director to Device Controller
DSC	Dual Storage Control
DSU	Disk Storage Unit
DVRR	Dual Volume Reserve/Release
ECO	Engineering Change Order
EPO	Emergency Power Off
FCO	Field Change Order
FMC	Fixed Module Drive Controller
FMD	Fixed Module Drive
GRN	Green
GRY	Grey
HPD	High Performance Drive
HSC	Head of String Controller
I/O	Input/Output
IMPL	Initial Microprogram Load
IPL	Initial Program Load
ISC	Integrated Storage Control
MOD	Module, Model
N/A	Not Applicable
OEM	Original Equipment Manufacturers
ORN	Orange
PCU	Power Control Unit
S/C	Series Code
SC	Storage Control
SD	Storage Director
SEQ	Sequence
SPO	Special Option
SS	String Switch
STO	Standard Option
TBS	To Be Supplied
VIO	Violet
VOL	Volume
W/	With
W/O	Without
WHT	White
YEL	Yellow

SECTION 1

GENERAL INFORMATION

GENERAL INFORMATION 1

INTRODUCTION

This section provides general background information to help you understand the basic concept of installing a subsystem. It also contains basic equipment setup procedures applicable to all of the units in a subsystem.

The manual frequently uses specialized abbreviations. Refer to the front matter for their definitions.

SUBSYSTEM DESCRIPTION

GENERAL

An end-user disk memory subsystem consists of a storage control unit, one to four controllers, and one to thirty-two drives. The subsystem provides direct access storage for the following medium-to-large scale IBM computer systems:

Family	Model
System/360	85
	195
System/370	135
	138
	145
	148
	155-II
	158
	165-II
	168
	195
System/303X	3031
	3032
	3033
System/43XX	4331
	4341
System 308X	3081

When the subsystem is attached to System/360 Models 85 and 95, or System/370 Models 165-II, 168, or 195, information is interfaced via the system block multiplexer channel. All other mod-

els must be interfaced via the IBM 2880 Block Multiplexer channel.

STORAGE CONTROL

The storage control is a microprogrammed control unit that interfaces the subsystem to an IBM block multiplexer channel. It interprets commands and control signals received from the channel, transmits and receives data between the channel and controller, and transmits status information to the channel.

CONTROLLER

The controller interfaces data between the storage control and the drive, receives control signals from the storage control, and transmits controller and drive status to the storage control. The controller establishes the pattern of data to be stored on the drive's storage medium, and checks to ensure that data is read correctly from the storage medium.

A controller function can be either a standalone unit (such as the FV605 CAU) or have its logic integrated with the drive (such as the BZ6XX FMC). Regardless of the physical construction, the controller function is independent of the drive function. The term "string" is used in this manual: a string is a controller and its attached drives. Every string must have a controller to provide control of power on/off and operation for all units in the string.

DRIVE

The drive is a peripheral storage device that stores data on a recording medium. It receives control signals from the controller, stores and retrieves data, and transmits status information to the controller.

The term "drive" is used as a general name regardless of the official title (Disk Storage, etc.). A drive may have either one or two spindles within one cabinet.

SUBSYSTEM EQUIPMENT MIX

STORAGE CONTROL

The subsystem may interface to the channel via one of the following storage controls:

- CDC FA721 or FA109 Storage Control (SC)
- CDC FA113 Dual Storage Control (DSC)
- IBM 3830 Model 2 Storage Control (SC)
- IBM System/370 Model 145 and 148 Integrated Storage Control (ISC)
- IBM System/370 Model 145 SC Frame 3345 Models 3,4, and 5 ISC
- IBM System/370 Model 158 and 168 ISC.

When attached to the FA721 or FA109, or IBM 3830 Model 2, the subsystem provides direct access storage via a single storage and control path. The FA113 provides two storage and control paths. Figure 1-1 shows the storage and control paths.

When attached to the IBM ISC, the subsystem provides direct access storage via a block multiplexer channel. Depending upon the computer model, the ISC provides either one or two storage and control paths, as shown in figure 1-1.

Each storage and control path is capable of interfacing up to 32 drive spindles (four physical strings of up to 8 spindles).

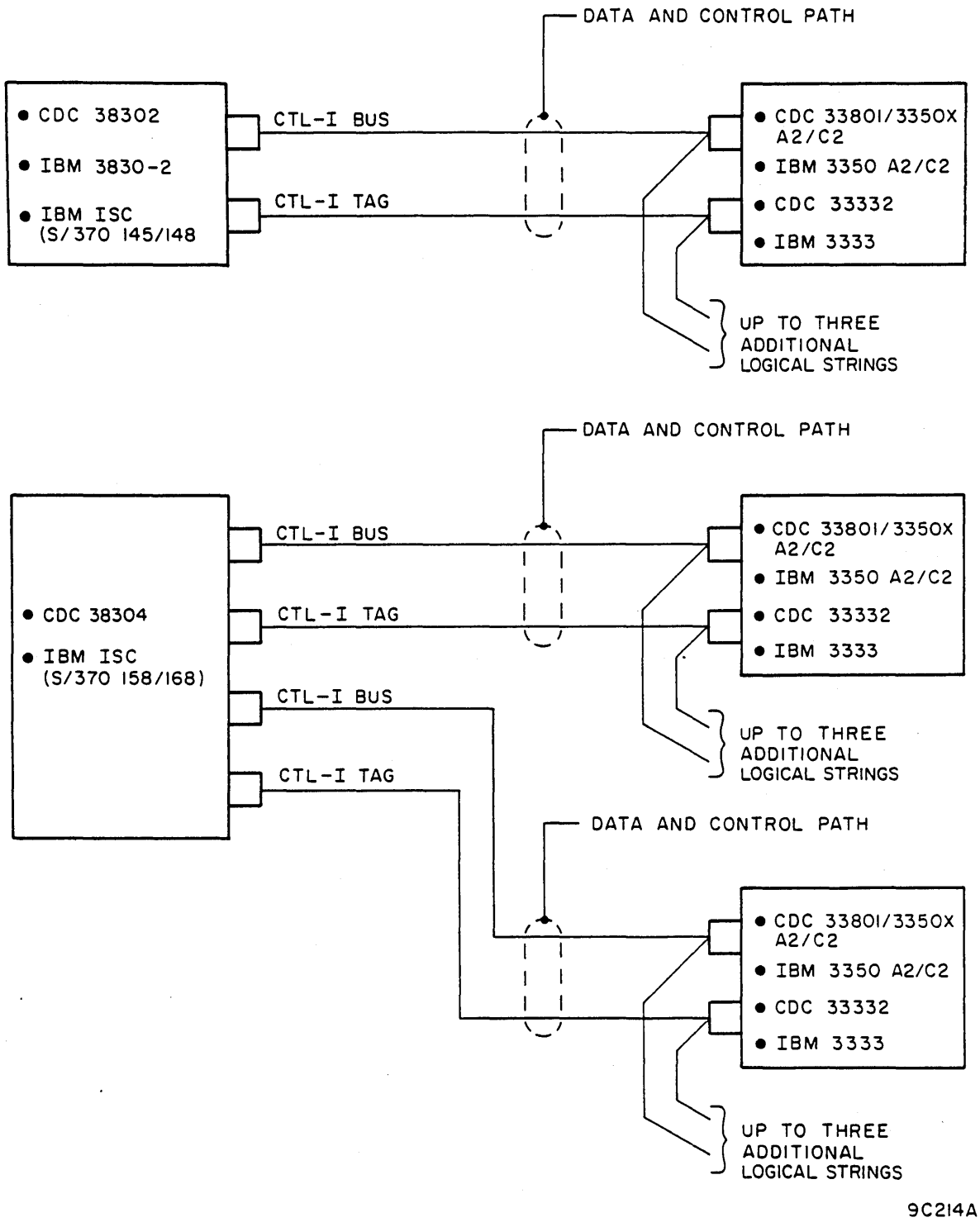


Figure 1-1. Storage and Control Paths

CONTROLLER/DRIVE

Each drive string is headed by a controller that is unique to the drive type. The controller interfaces the drive string to the storage control.

A subsystem may consist of the following controller/drive groups:

Group	Controller	Drive Type
I	CDC FMC (w/o DVRR)	CDC FMD
II	CDC FMC (w/DVRR)	CDC FMD
III	CDC CAU	CDC HPD
IV	IBM CAU	IBM 3330-11
V	IBM FMC	IBM 3350

Controller/drive groups cannot be intermixed within the same string. For example, the group I controller cannot be attached to the group II drive. It is assumed that IBM groups (IV and V) are included in the same subsystem with CDC groups. The subsystem may consist of up to four controller/drive groups (strings) intermixed in any combination. All drive groups must be interfaced to the system via a block multiplexer channel.

GENERAL GROUNDING REQUIREMENTS

The site power system must have provision for proper equipment grounding. ALL of the following requirements must be met:

1. The branch circuit supplying ac power to the storage control and devices must have an insulated grounding conductor that is equal in cross-section to each of the phase conductors. On domestic installations, the insulated grounding conductor must show either a green color or green with yellow stripe.

2. All equipment grounding conductors within the computer facility must be tied together in the computer room distribution panel and conducted back to main building (earth) ground.

3. All convenience outlets must be equipped with a grounding conductor that is tied to the same ground point as the equipment grounding conductors.

4. All other aspects of the equipment site grounding shall meet the requirements of Article 250 of the National Electrical Code.

MICROPROGRAMS

Several microprogram disks are available for the various subsystem configurations. Information on the specific effectivity and capability of each disk is provided by tables in each of the section 2 subsections. Table 1-1 provides a short list of the available disks and their latest revision levels as of the last revision to this manual. The disks are listed in disk part number order.

CAUTION

Do not order or use disks based solely on the information in table 1-1. Certain disks are not interchangeable between various storage controls and their attached controllers and drives. Always refer to section 2 to determine the basic disk effectivity before using any disk in your unit.

TABLE 1-1. AVAILABLE MICROPROGRAM DISKS

Disk Part Number	End-User Equipment Number	Last FCO		Description (Primary Storage Control Used)
		Standard	OEM	
47386106	MF110H	DH06005	None	CDC 3330X/33801/ 3350X Device Functional (IBM ISC or 3830-2 storage control)
47389400	MF113H	None	None	IBM 3350 Device Inline Diagnostics (IBM ISC or 3830-2 storage control)

Table Continued on Next Page

TABLE 1-1. AVAILABLE MICROPROGRAM DISKS (Contd)

Disk Part Number	End-User Equipment Number	Last FCO		Description (Primary Storage Control Used)
		Standard	OEM	
47389900	MF112H	None	None	IBM 3350 Device Inline Diagnostics (FA109)
94092902 (Rev C)	MF131H	None	None	CDC 3350X Functional Disk Package (SMB Option) (FA162/FA163)
94182802 (Rev C)	MF132H	None	None	CDC 33800 Functional Disk Package (SMB Option) (FA163)
72880004	MF119H	DH06025	DH06028 (FA1A2)	CDC 3330X/33801/ 3350X Device Non-Sequential Functional (FA113)
72882200	MF120H	None	None	CDC 33801/3330X/ 3350X; IBM 3330/ 3350 Device Sequential Addressing Functional (FA109)
72883200	MF122H	None	None	CDC 33801/3330X/ 3350X; IBM 3330/ 3350 Device Sequential Addressing Functional (FA113). Obsolete.

Table Continued on Next Page

TABLE 1-1. AVAILABLE MICROPROGRAM DISKS (Contd)

Disk Part Number	End-User Equipment Number	Last FCO		Description (Primary Storage Control Used)
		Standard	OEM	
72885100	MF125H	None	None	CDC 38302/3350X Inlines for Dual Volume (FA109)
72885400	MF123H	None	None	CDC 38304/3350X Inlines for Dual Volume (FA113)
72888417 (Rev V)	MF126H	DJ18045 (Rev V)	N/A	CDC 38800/3350X Functional Disk Package (FA161/ FA162/FA163)
72886404 (Rev E)	MF127H	DJ18041 (Rev E)	None	CDC 38302/3350X Functional for Dual Volume (FA109)
72886504 (Rev E)	MF128H	DJ18042	None	CDC 38304/3350X Functional for Dual Volume (FA113)
73151300	MF106H MF125H	None	None	CDC 33801/3350X Device Surface Analysis Test Disk (FA109)
73151601	MF118H	DH06002	None	CDC 33801/3350X Device Inline Diagnostics (FA113)
73151800	MF118H MF123H	None	None	CDC 33801/3350X Device Surface Analysis Test Disk (FA113)

Table Continued on Next Page

TABLE 1-1. AVAILABLE MICROPROGRAM DISKS (Contd)

Disk Part Number	End-User Equipment Number	Last FCO		Description (Primary Storage Control Used)
		Standard	OEM	
73158100	MF116H	None	None	CDC 3330X Device Inline Diagnostics (FA113)
73158300	MF117H	None	None	IBM 3350 Device Inline Diagnostics (FA113)
73159700	MF118H MF123H	None	None	CDC Standalone Diagnostics (FA113)
73680214	FA721 & TB119	PE45150	PE45198 (FA7B3)	CDC 3330X Device Inline Diagnostics (FA721 & FA109)
73686710	FA721, MF106H, MF125H, & TB119	PE45164	PE45165 (FA7A9 & FA7B3)	Standalone Diagnostics (FA721 & FA109)
73698413	None	PE45093	PE45093 (FA7A9)	CDC 8-Volume 3330X Device Functional (FA721 & FA109)
75126701	MF105H	None	None	CDC 3330X Device 2-Channel Functional (IBM ISC or 3830-2 storage control)

Table Continued on Next Page

TABLE 1-1. AVAILABLE MICROPROGRAM DISKS (Contd)

Disk Part Number	End-User Equipment Number	Last FCO		Description (Primary Storage Control Used)
		Standard	OEM	
77465410	FA721 & MF111H	PE45170	N/A	CDC 32-Volume 3330X Device Functional (FA721)
77472405	TB120	PE45161	None	CDC 3330X Device Inline Diagnostics (IBM ISC or 3830-2 storage control)
77829606	FV649 & FV650	PE45086	None	System 360/65 (STO 68602) Functional (FA721)
82322605	MF109 (S/C 1-8)	PE45113	None	CDC 3330X/33801 Device Non-DAF Functional (FA109)
82381613	MF109H	DH06026	DH06027 (FA7B3)	CDC 3330X/33801/ 3350X; IBM 3350 Device DAF Functional (FA109)
83272001	MF107H	PE45159	None	CDC 33801/3350X Device Inline Diagnostics (IBM ISC or 3830-2 storage control)
83272307	MF106H	DH06000	DH06003 (FA7B3)	CDC 33801/3350X Device Inline Diagnostics (FA109)
83273103	MF104H	PE45094	None	CDC 3330X Device 4-Channel Functional (IBM ISC or 3830-2 storage control)

SAFETY PRECAUTIONS

WARNING

Observe all of the following safety precautions. Failure to do so may cause personal injury or equipment damage. Wear wrist strap whenever working with boards.

1. Do not work alone when exposed high voltages are present. Make sure somebody familiar with all power off controls is present.

2. Unplug ac power input cable before performing any maintenance on power cables, power distribution units, or ac cables to dc power supplies. Unswitched high voltages can be present in or near these assemblies.

3. Do not wear watches, rings, or other jewelry. Do not wear loose clothing.

4. Use only insulated pliers and screwdrivers.

5. Make sure that test instruments have insulated probes. Don't let the probes dangle. Also ensure that controls are set correctly.

6. Wear safety glasses whenever working with sealants or performing mechanical actions that could cause particles to fly out.

7. Keep tools in good condition. Replace them if worn or broken.

8. Keep tool boxes, test equipment, and removed machine covers out of the way where no one can trip over them.

9. Do not bend over to lift items: stand or push up with your legs. Power supplies (especially power distribution units) are very heavy. If power supply exceeds 11 kilograms (25 pounds), two people are required to lift the power supply.

10. Remove all power from circuits when removing logic boards or other components.

11. Maintain good housekeeping before, during, and after completing maintenance.

12. Observe all electrostatic precautions.

13. Do not place tools or other metal objects on top of logic chassis as electrical components may be shorted to ground.

14. Do not place manuals or other documents on top of logic chassis, power supplies or PCUs as this will block cooling air flow.

SECTION 2

CDC STORAGE CONTROLS INSTALLATION

CDC STORAGE CONTROLS INSTALLATION 2

INTRODUCTION

The storage control contains the logic required to interpret and execute commands issued by the channel, control the transfer of data between the channel and controller, provide the channel with subsystem status, execute diagnostic tests, and sequence ac power to all attached drive strings.

STORAGE CONTROLS

Refer to table 2-1 for a description of CDC storage control units.

INSTALLATION CHECK LIST

The installation check list (table 2-2) is for experienced service personnel to use as a guide in performing installation checks. More detailed information is provided in each of the storage control subsections.

TABLE 2-1. STORAGE CONTROL PRODUCT NUMBERS

Product Number	Note	Equipment Number	Attachable Channels	Memory Size	Operating Frequency
38302-1		FA721-A FA721-B	one	4K	60 Hz 50 Hz
38302-2		FA721-C FA721-D	two		60 Hz 50 Hz
9086-1		FA7A9-A			60 Hz
38302-3		FA721-G, N FA721-H, P	one	6K	60 Hz 50 Hz
38302-4		FA721-J, R FA721-K, S	two		60 Hz 50 Hz
38302-5		FA721-L, T FA721-M, U	four		60 Hz 50 Hz
38302-6	1	FA109-N FA109-P	one	8K	60 Hz 50 Hz
38302-7	1	FA109-R FA109-S	two		60 Hz 50 Hz
38302-8	1	FA109-T FA109-U	four		60 Hz 50 Hz
38304-1	2	FA113-A FA113-B	one per SD	8K per SD	60 Hz 50 Hz
38304-2	2	FA113-C FA113-D	two per SD		60 Hz 50 Hz
38304-4	2	FA113-E FA113-F	four per SD		60 Hz 50 Hz

Table Continued on Next Page

TABLE 2-1. STORAGE CONTROL PRODUCT NUMBERS

Product Number	Note	Equipment Number	Attachable Channels	Memory Size	Operating Frequency
38800-1	3	FA161-A FA161-B	one per SD	32K per SD	60 Hz 50 Hz
	3	FA161-C,E FA161-D,F	two per SD		60 Hz 50 Hz
	3	FA161-G FA161-H	eight per SD (shared)		60 Hz 50 Hz
38800-3	4	FA163-A FA163-B	one per SD	32K per SD	60 Hz 50 Hz
	4	FA163-C,E FA163-D,F	two per SD		60 Hz 50 Hz
	4	FA163-G FA163-H	eight per SD (shared)		60 Hz 50 Hz

NOTES:

1. For OEM models, product number is 9088; equipment number is FA7B2 or FA7B3.
2. For OEM models, product number is 9079; equipment number is FA1A2.
3. Storage directors control controllers via the CTL interface. No comparable OEM models.
4. Storage directors control controllers via the DDC interface. For OEM models, product number is 90880-3; equipment number is FA1A3 or FA1B2.

TABLE 2-2. STORAGE CONTROL INSTALLATION CHECK LIST

PRE-INSTALLATION	
( )	Check to ensure that all applicable hot line TWXs, service bulletins, unverified service bulletins, and deviations are on site.
( )	Check to ensure that all applicable manuals (at correct revision level) are on site.
( )	Check to ensure that customer-provided power receptacle/connector has the proper current rating and is located no more than 3.7 metres (12 feet) from the storage control.
( )	Check to ensure that customer source voltage is in accordance with equipment specifications.
( )	Check planned floor layout and floor cutouts for compliance with site planning kit.
( )	Check air conditioning ducts to ensure adequate equipment cooling.
( )	Check to ensure that special tools, test equipment, spares, etc. are on site.
EQUIPMENT SETUP	
( )	Uncrate storage control and check for damage in transit. Refer damage complaints to carrier.
( )	Remove and inventory all storage control accessories and loose parts.

Table Continued on Next Page

TABLE 2-2. STORAGE CONTROL INSTALLATION CHECK LIST (Contd)

( )	Remove floor tiles as necessary and place all channel cables into position underneath false floor. Label all bus and tag cables. Replace tiles.
( )	Move storage control into position and place power cord underneath false floor. Plug in power cord (main ac circuit breaker should be off).
	MECHANICAL INSPECTION
( )	Visually inspect back panel. Check for bent pins, recessed pins, broken wires, etc.
( )	Visually inspect card rack. Check for missing, loose, or improperly positioned cards.
	ELECTRICAL INSPECTION
( )	Set voltage taps on power control unit and dc power supplies to proper source voltage. Storage control is normally set at factory to accept 208 V, 60 Hz or 380 V, 50 Hz.
( )	Check all power supply connections, fuse holders, filters, circuit breakers, etc.
	Table Continued on Next Page

TABLE 2-2. STORAGE CONTROL INSTALLATION CHECK LIST (Contd)

JUMPER/SWITCH SELECTIONS	
( )	Set up address, channel priority, mode, and machine configuration switch/jumper selections.
POWER ON CHECKS	
( )	Install all channel cables. Install all required channel terminators and EPO plugs.
( )	Set storage control circuit breakers to their ON position.
( )	Turn on power and check for power on indication. Ensure that logic gate fans are operating.
( )	Check power supplies for proper voltage levels.
( )	Check operation of maintenance and operator panels.
DIAGNOSTIC CHECKS	
( )	Perform diagnostic tests as called for in applicable storage control installation subsection.

SECTION 2A

CDC FA721 STORAGE CONTROL INSTALLATION

SECTION 2D

CDC FA16x STORAGE CONTROL INSTALLATION

INTRODUCTION

This section contains installation procedures, a listing of special tools and equipment, and a listing of the currently available microprogram flexible disks.

NOTE

The two storage directors within the storage control have unrelated electronic connections, response to channel operations, logical addressing, and availability for maintenance routines. Except for the ac power connections, all other connections and procedures must be performed twice.

All units must be configured for the on-site source voltage. Address and option selections must be made in cooperation with the user and in accordance with the equipment within the system. Finally, the unit must be checked for proper operation before being put into service.

TERMINOLOGY

The following discussion defines the terminology used in this section:

Mod 1 This is the FA161 and it controls 3350-type drives via the FMC (Fixed Module Controller). Signals between a storage director and controller use the CTL interface.

Mod 2 This is the FA162. The first storage director (SD1) provides features of a Mod 1 unit while the second (SD2) provides those features of the Mod 3.

Mod 3 This is the FA163 and it controls 3380-type (DSU) drives via the HSC (Head of String Controller). Signals between a storage director and controller use the DDC interface.

DSU This is the 3380-type drive (such as the BZ640) and is the drive used with the Mod 2 and 3 storage control units.

Unless otherwise specified, all procedures in this section apply to all FA16x storage controls.

ELECTROSTATICALLY SENSITIVE PRECAUTIONS

Metal oxide semiconductor (MOS) integrated circuits are used on the logic boards and I/O boards in the unit. MOS integrated circuits are extremely sensitive and therefore require special handling to avoid damage caused by static electricity. Observe the following precautions whenever any maintenance is performed:

- Turn off power before removing and installing the logic board.
- Ensure that anything or anyone coming in contact with the board is electrically connected to ground, including tools, the body, clothing, containers, etc.
- Plug grounded wrist strap into any one of the four banana jacks on the frame as shown in figure 2D-1.
- Touch the logic chassis to bleed off any accumulated static charge before removing or installing the board.
- Handle the board only by a non-circuit portion. Do not touch pins and circuit connections points.
- Never use an ohmmeter on boards having microprocessor assemblies.
- Always remove the boards before using an ohmmeter on the controller.
- Place the board in a conductive shielded bag immediately following its removal from the unit. The board and the bag must be in contact with logic chassis ground before and during the time that the board is inserted or removed from the bag. The bag should have a warning label indicating that it contains an electrostatic-sensitive device. The logic board must remain in the bag or at a properly prepared work station whenever it is not installed in the logic chassis.

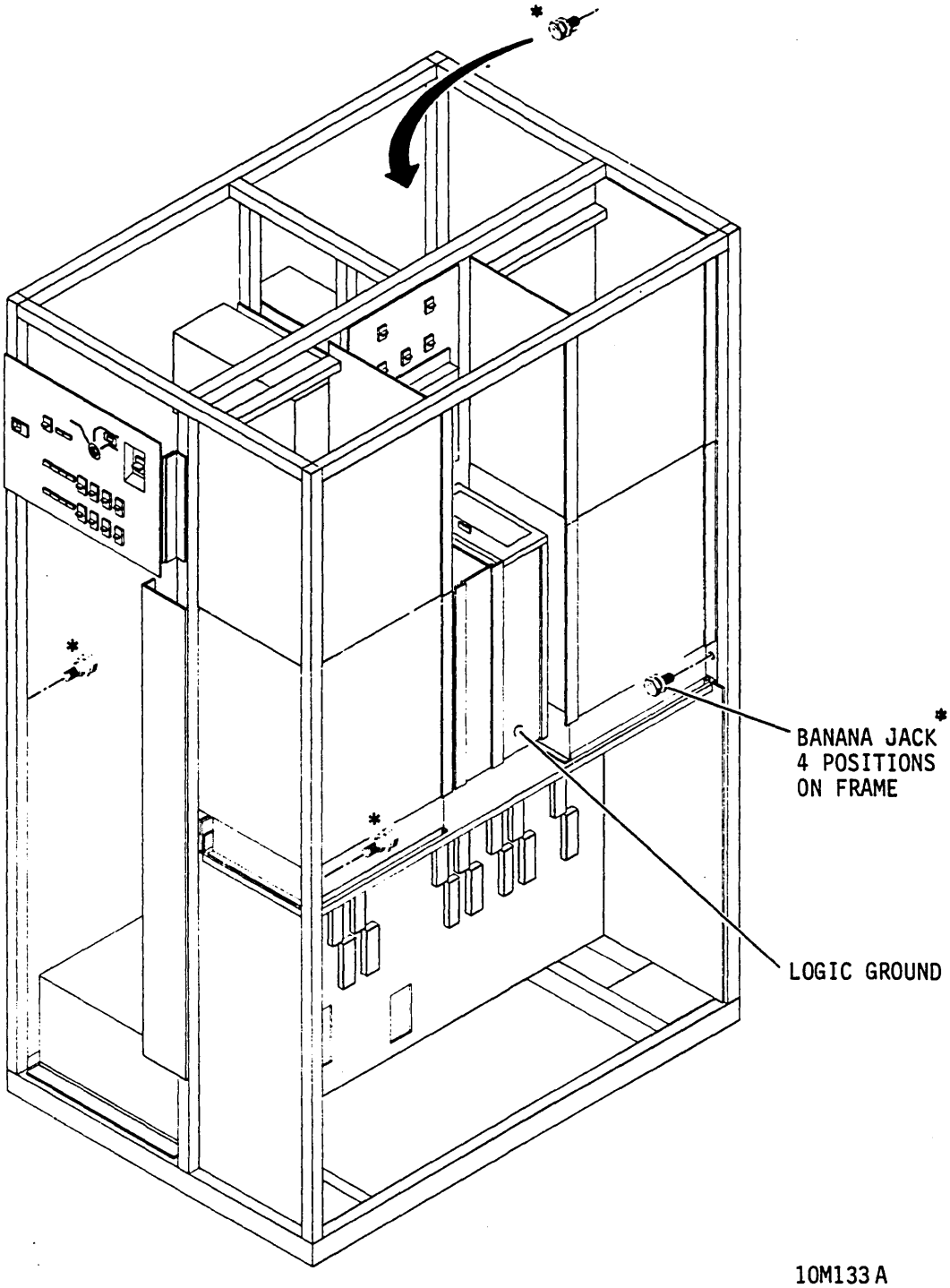


Figure 2D-1. Wrist Strap Plug-in Locations

SPACE REQUIREMENTS

Figure 2D-2 illustrates the floor space requirements for the storage control. All cables connected to the storage control must be routed underneath the false floor. The floor cutout dimensions should match the cable entry shown in figure 2D-2.

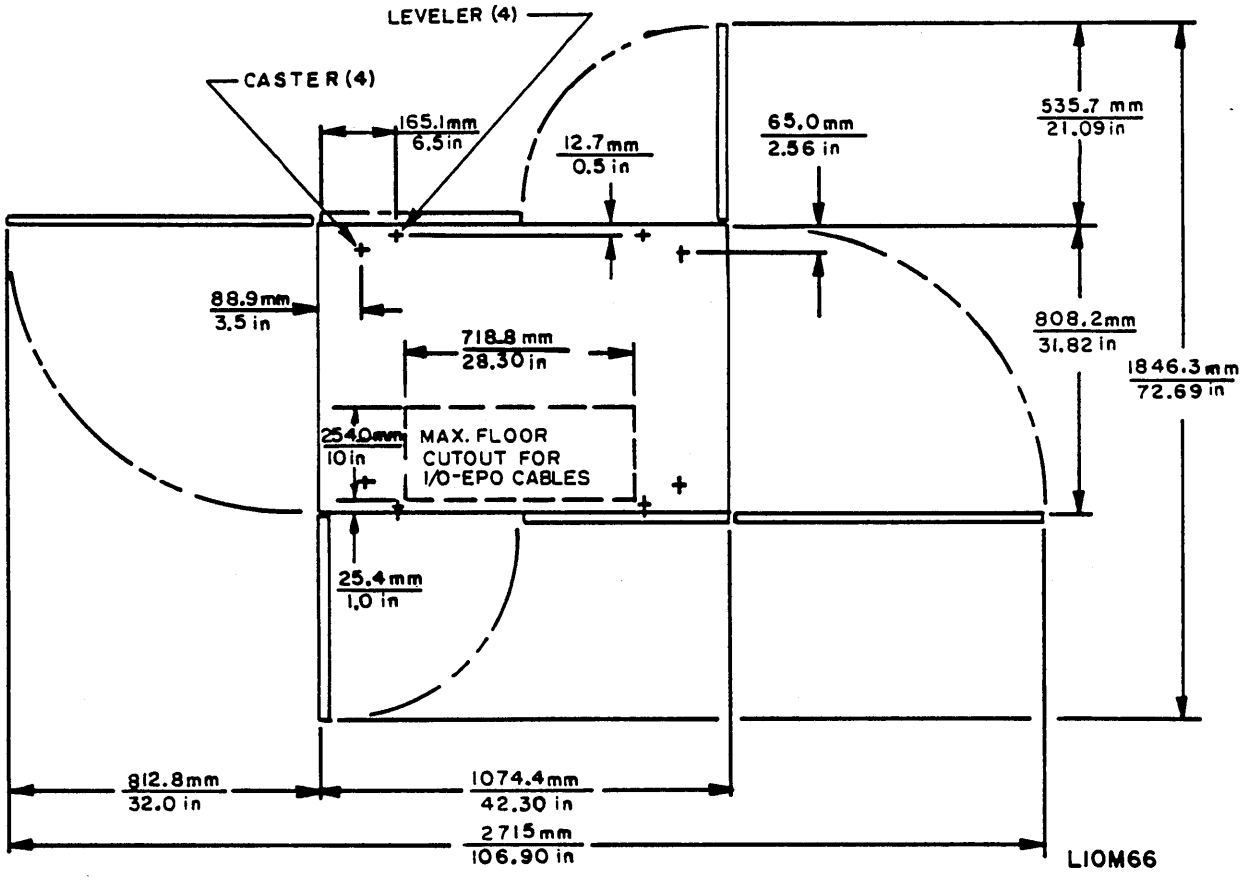


Figure 2D-2. Storage Control Space Requirements

INSPECTION

When uncrating the equipment, inspect the carton for possible shipping damage. All claims for this type of damage should be filed with the carrier involved.

Most crating materials may be reused if reasonable care is taken when uncrating.

If it becomes necessary to repackage the equipment for reshipment, packaging instructions can be obtained from:

Packaging Engineer, Material Service Dept.
Magnetic Peripherals, Inc
7801 Computer Avenue
Minneapolis, MN 55435

UNCRATING

Uncrating instructions are packed on the outside of the shipping crate. Refer to these instructions for proper handling of the unit.

INVENTORY

When uncrating is complete, check off all parts listed in the shipping bill accompanying the equipment. Discrepancies, missing items, damaged equipment, etc, should be reported to your Account Sales Representative responsible for the equipment.

LEVELING AND PLACEMENT

Roll unit into its final floor position as assigned in the site planning kit. Level unit by performing the following steps:

1. Open side doors.

2. Insert leveler extension and screw into frame far enough so that pad can be pressed into place. Press pad in place as shown in figure 2D-3. Turn leveler until pad touches the floor.

3. Repeat these steps for all levelers.

4. Use 5/8 inch wrench on the hex surface (just above the pad) of each leveler to lower levelers until casters are off the floor.

5. Place spirit level on base of frame so ends of level point to front and rear of unit.

6. Adjust levelers until bubble is centered on spirit level.

7. Place spirit leveler on base of frame so ends of level point to sides of unit.

8. Adjust levelers until bubble is centered on spirit level.

9. Repeat steps 4 through 8 until unit is level.

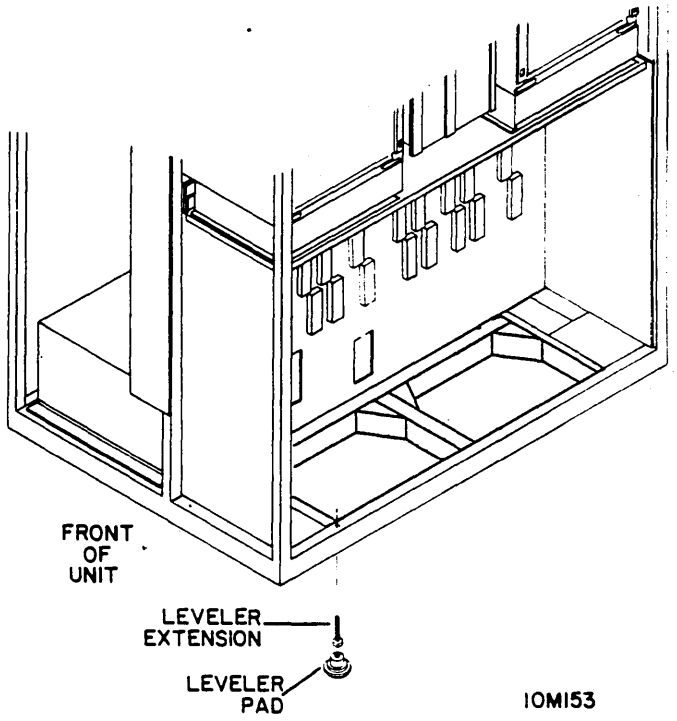


Figure 2D-3. Leveling

I/O CABLES

All I/O cables (signal, EPO, and grounding) between the storage director and the channel, and between the storage director and its controllers, connect to connectors on the PCU and the I/O panel as shown in figure 2D-4. Table 2D-1 lists the channel cable lengths and table 2D-2 lists the most commonly used channel I/O accessory cable lengths.

The maximum path length is reduced 4.6 metres (15 feet) for each additional daisy-chained storage director/controller.

TABLE 2D-1. CHANNEL CABLE LENGTHS

CPU Model	Configuration	Length (Metres)
135, 138, 145, 148, 155, 158	All	76 (250 ft)
168/2880	All	76 (250 ft)
4331-2, 4341, 303X	Without Speed Matching Buffer	121.9 (400 ft)
4331-2, 4341, 303X	*With Speed Matching Buffer	76 (250 ft)
4331-2, 4341, 303X 308X	*Data Streaming	122 (400 ft)

NOTE: *Speed Matching Buffer and Data Streaming options used on Mod 3 units only.

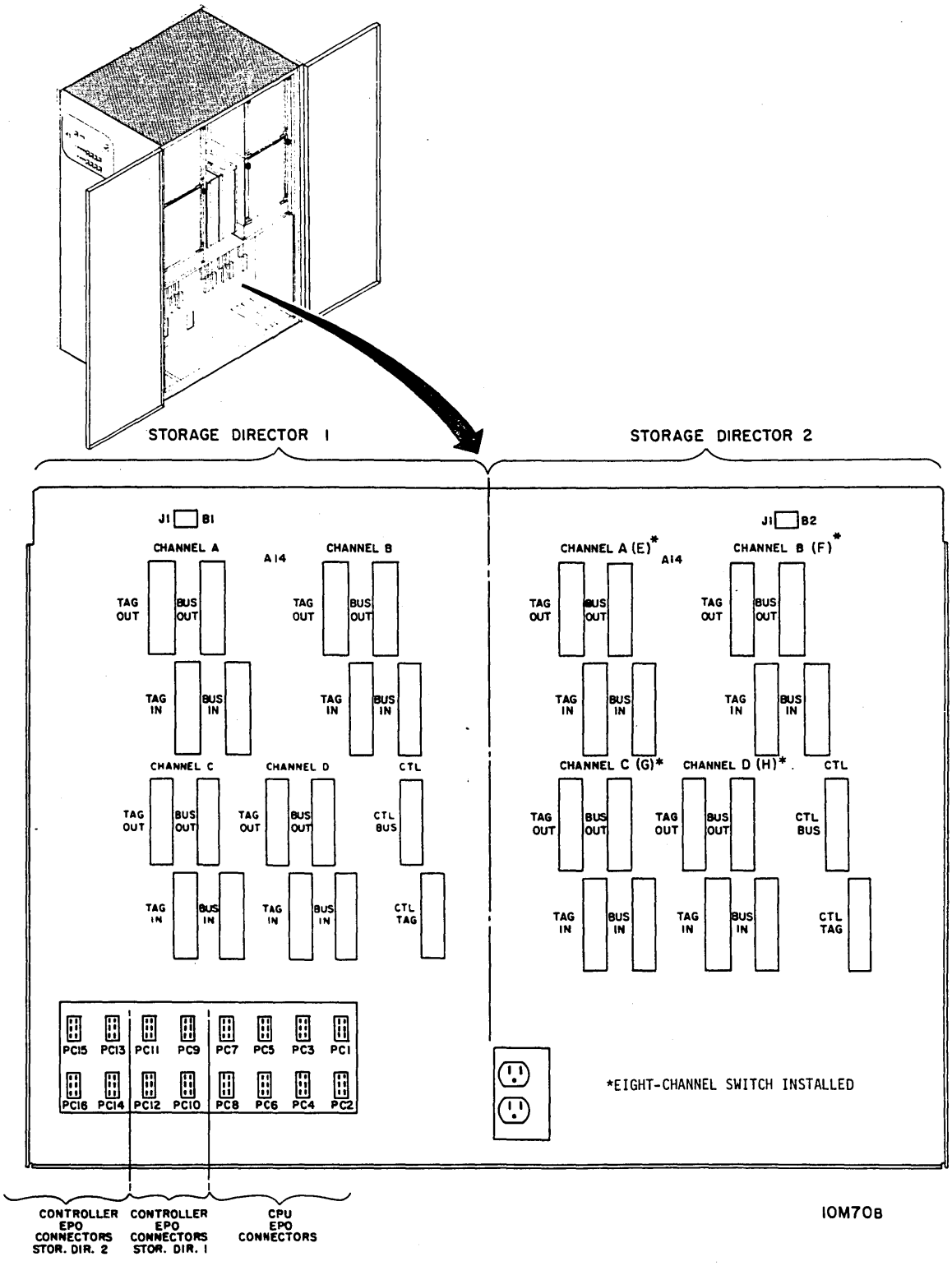


Figure 2D-4. I/O-EPO Connector Panel

TABLE 2D-2. CHANNEL I/O ACCESSORY CABLES

Part	Length (metres)	Part No.
NOTE: See end of table for special notes.		
BUS/TAG	2 (5 ft)	73168600
	3 (10 ft)	73168601
	5 (15 ft)	73168602
	6 (20 ft)	73168603
	8 (25 ft)	73168604
	9 (30 ft)	73168605
	11 (35 ft)	73168606
	12 (40 ft)	73168607
	14 (45 ft)	73168608
	15 (50 ft)	73168609
	17 (55 ft)	73168610
	18 (60 ft)	73168611
	20 (65 ft)	73168612
	21 (70 ft)	73168613
	23 (75 ft)	73168614
	24 (80 ft)	73168615
	26 (85 ft)	73168616
	27 (90 ft)	73168617
	29 (95 ft)	73168618
	30 (100 ft)	73168619
	34 (110 ft)	73168620
	36 (120 ft)	73168621
	40 (130 ft)	73168622
	43 (140 ft)	73168623
	45 (150 ft)	73168624
Table Continued on Next Page		

TABLE 2D-2. CHANNEL I/O ACCESSORY CABLES (Contd)

Part	Length (metres)	Part No.
BUS/TAG	49 (160 ft)	73168625
	52 (170 ft)	73168626
	55 (180 ft)	73168627
	58 (190 ft)	73168628
	60 (200 ft)	73168629
	67 (220 ft)	83645430
	73 (240 ft)	83645431
	79 (260 ft)	83645432
	85 (280 ft)	83645433
	91 (300 ft)	83645434
	98 (320 ft)	83645435
	104 (340 ft)	83645436
	110 (360 ft)	83645437
	116 (380 ft)	83645438
	122 (400 ft)	83645439
EPO	2 (5 ft)	72920800
	3 (10 ft)	72920801
	5 (15 ft)	72920802
	6 (20 ft)	72920803
	8 (25 ft)	72920804
	9 (30 ft)	72920805
	11 (35 ft)	72920806
	12 (40 ft)	72920807
	14 (45 ft)	72920808

Table Continued on Next Page

TABLE 2D-2. CHANNEL I/O ACCESSORY CABLES (Contd)

Part	Length (metres)	Part No.
EPO	15 (50 ft)	72920809
	17 (55 ft)	72920810
	18 (60 ft)	72920811
	20 (65 ft)	72920812
	21 (70 ft)	72920813
	23 (75 ft)	72920814
	24 (80 ft)	72920815
	26 (85 ft)	72920816
	27 (90 ft)	72920817
	29 (95 ft)	72920818
	30 (100 ft)	72920819
	34 (110 ft)	72920820
	36 (120 ft)	72920821
	40 (130 ft)	72920822
	43 (140 ft)	72920823
	45 (150 ft)	72920824
	49 (160 ft)	72920825
	52 (170 ft)	72920826
	55 (180 ft)	72920827
	58 (190 ft)	72920828
	60 (200 ft)	72920829
	67 (220 ft)	72920833
	73 (240 ft)	72920837
	79 (260 ft)	72920841
	85 (280 ft)	72920845

Table Continued on Next Page

TABLE 2D-2. CHANNEL I/O ACCESSORY CABLES (Contd)

Part	Length (metres)	Part No.
EPO	91 (300 ft)	72920849
	98 (320 ft)	72920853
	104 (340 ft)	72920857
	110 (360 ft)	72920861
	116 (380 ft)	72920865
	122 (400 ft)	72920869

NOTES:

1. One Bus/Tag cable set is required for each channel connection. One EPO cable is required per channel for each host system. Two signal cables are required per channel for each host system.
2. Cable lengths for bus/tag/EPO other than those specified above are available by special order.

I/O SIGNAL CABLES

All data and data control (I/O) signals are transfered as follows:

- All channel-to-storage director are bus/tag cables
- Storage director-to-FMDs are bus/tag cables.
- Storage director-to-HSCs are DDC (director to device cables).

All cable connections to the storage director are made at the front of the I/O panel as shown in figure 2D-3; available tag and bus cable lengths are shown in table 2D-2. Cables listed in table 2D-2 are used with Mod 1 units. For cable information pertaining to Mod 3 units, refer to section 4E of this manual.

Cables from channels are either terminated at the storage director by tag terminator P/N 94252800 and bus terminator P/N 75268900, or are daisy chained to following storage directors and storage controllers.

Cables to controllers are daisy chained, and terminated at the last controller by P/N 75268900 (2 each channel) in FMDs and by P/N 75268902 in HSCs.

Do not install controller cables until directed by Initial Startup and Testing. Terminators are required on all controller connectors for testing.

Route two signal cables through cable clamp and tighten clamps as shown in figure 2D-4.

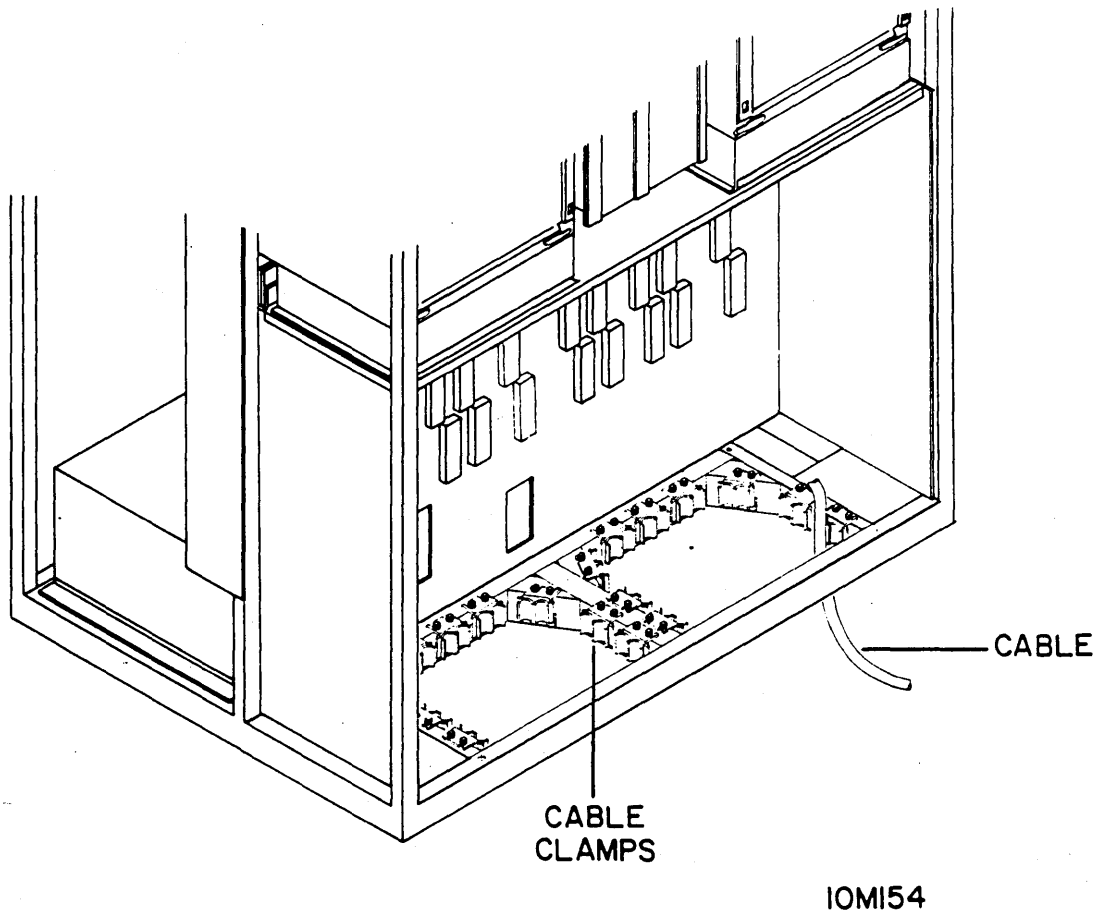


Figure 2D-5. Routing I/O Signal Cables

POWER SEQUENCE CONTROL CABLES

All emergency power-off (EPO) and normal power-on sequence signals are communicated between a CPU and a storage director by one EPO cable; each CPU requires one cable regardless of the number of its channels connected to the storage director. Each controller attached to the storage director requires a separate EPO cable. All of the EPO cables are connected at the storage director I/O panel locations shown in figure 2D-4. The available EPO cable lengths are shown in table 2D-1.

- EPO cables from the CPU may connect to any connector PC-1 through PC-8.

- EPO cables to the controllers of storage director 1 may connect to any connector PC-9 through PC-12, with power-up in that sequence by the microprogram.

- Storage director 2 uses connectors PC-13 through PC-16 in the same manner.

Do not install CPU or controller EPO cables until directed by Initial Startup and Testing. Install simulator plugs as follows:

1. Install plug P/N 72947100 in any one of the CPU connectors PC-1 through PC-8. This plug provides an EPO return path so that the unit can be turned on.

2. Install plug P/N 72947101 in all controller connectors PC-9 through PC-16. These plugs provide a Power Complete path back to the storage control.

POWER CONNECTIONS

SOURCE VOLTAGE JUMPER INSTALLATION

CAUTION

Voltage jumpers must be attached to power supply terminals rated at, or lower than, the measured site voltage, before connecting to site power. Failure to match storage control power supply inputs to the measured site voltage can damage power supplies and degrade performance.

When shipped, storage controls are connected for either of the following power sources:

- 208 V, 60-Hz (phase to phase), or

- 220 V, 50-Hz (phase-to-neutral)

Four alternative voltages shown on the voltage jumper label (figure 2D-6) may be selected by moving one jumper at transformer T2, and three jumpers (60-Hz) or two jumpers (50-Hz) on card _MTN in the power control unit.

WARNING

Disconnect site power before removing the power control unit cover to move jumpers. Unswitched high voltage is present within the PCU.

To move jumpers refer table 2D-3. Figure 2D-6 shows power jumper installation information.

TABLE 2D-3. VOLTAGE JUMPERS

Hz	Input Voltage	T2 INPUT	A2 (T1) JUMPERS					
			FROM	TO	FROM	TO	FROM	TO
60	200	4	E2	E24	E20	E42	E38	E6
	208*	5	E2	E21	E20	E39	E38	E3
	220	6	E2	E34	E20	E52	E38	E16
	230	7	E2	E31	E20	E49	E38	E13
	240	8	E2	E28	E20	E46	E38	E10
50	345	4	E6	E24	E26	E42		
	360	5	E3	E21	E23	E29		
	380*	6	E16	E34	E36	E52		
	400	7	E13	E31	E33	E49		
	415	8	E10	E28	E30	E46		
* UNITS SHIPPED IN THIS CONFIGURATION								

POWER CABLE INSTALLATION

CAUTION

Voltage jumper installation must be correct and the UNIT POWER switch on the power control unit (figure 2D-6) must be off to avoid damage to power supplies.

Storage control power is provided through a 4.6 metre (15-foot) trailing power cable from the power control unit (PCU). The 50-Hz trailing power cables use no end connector, and are hard-wired to site power.

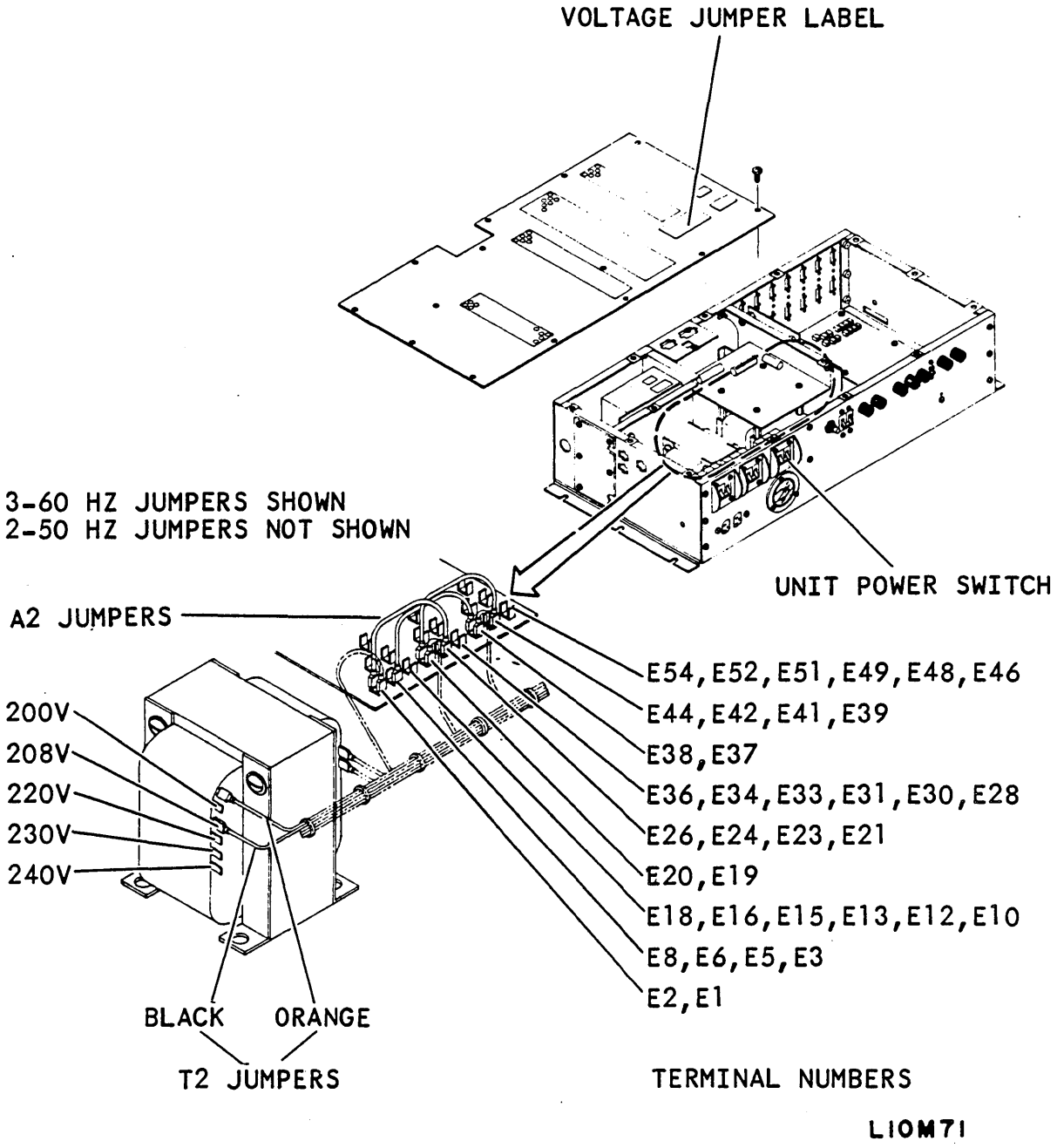


Figure 2D-6. Power Jumper Installation

SWITCH SETTINGS

CAUTION

Observe all electrostatically sensitive precautions when handling all boards.

The following procedures describe the switch settings for switches that must be set during installation.

CHANNEL TRANSMITTER/RECEIVER BOARD

-CSN Board

The Select Out Bypass switch located on the Channel Transmitter/Receiver Board (_CSN Board) on the I/O panel should be in NORM position unless channel wraps are being executed. The board location is shown in figure 2D-7. Refer to the Hardware Diagnostic Reference manual for specific test information.

-GWN Board -- 8 Channel Option

The Normal/Test switch is located on a Channel Transmitter/Receiver Board (_GWN Board) as shown in figure 2D-7. Both toggles on the switch must be set the same. Set switches to NORM position unless channel wraps are being executed. Refer to the Hardware Diagnostic Reference manual for specific test information.

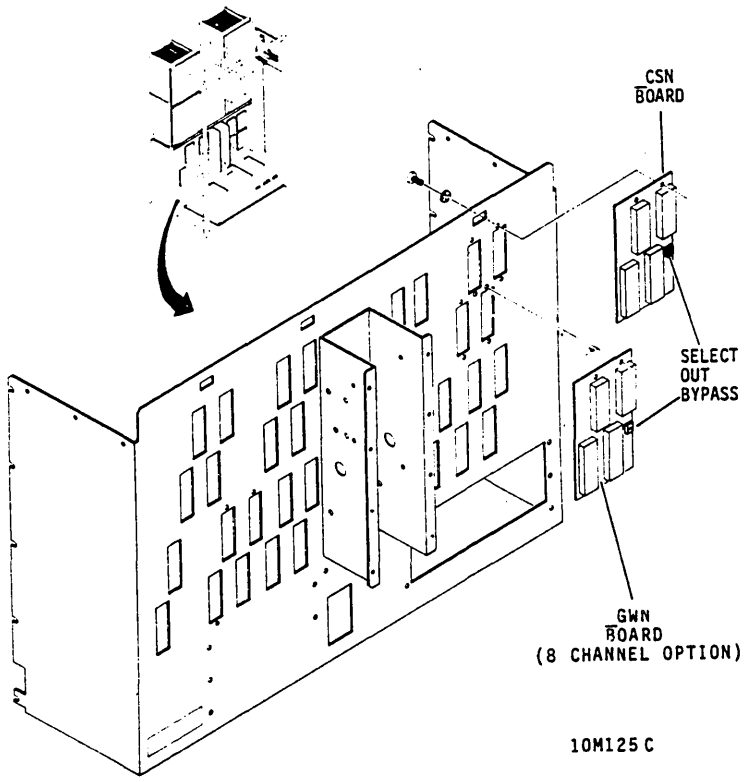


Figure 2D-7. Channel Transmitter/Receiver Board

CHANNEL SEQUENCE CONTROL BOARD

The Channel Sequence Control boards (_REX Board) are located at location 12 of the two I/O backpanels. The location of the Channel Speed Selection switches is shown in figure 2D-8. Each switch corresponds to a channel where switch 1 corresponds to channel A and switch 8 corresponds to channel H. Set switches as follows:

Mod 1 Switch Setting

Set all switches in OFF (open) position, which places each channel into Offset Interlock mode.

Mod 3 Switch Setting

NOTE

Check that the channel Unit Control Words (UCW's) are properly plugged.

Set all switches to ON (closed) for Data Streaming.

With Speed Matching Buffer Option - Each channel may be set ON (closed) individually to suit system requirements.

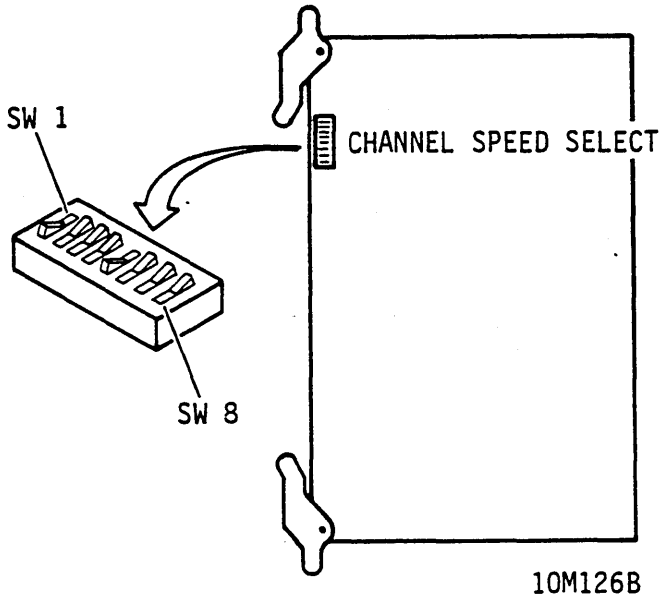


Figure 2D-8. Channel Sequence Control Board

DIRECTOR-TO-DEVICE CONTROLLER BOARD

The director-to-device controller (DDC) boards (_RJX board for Mod 1, _RHX board for Mod 3) are located at location 13 in the two I/O backpanels. Figure 2D-9 shows the location of the SD Configuration switches and the SD Identification switches.

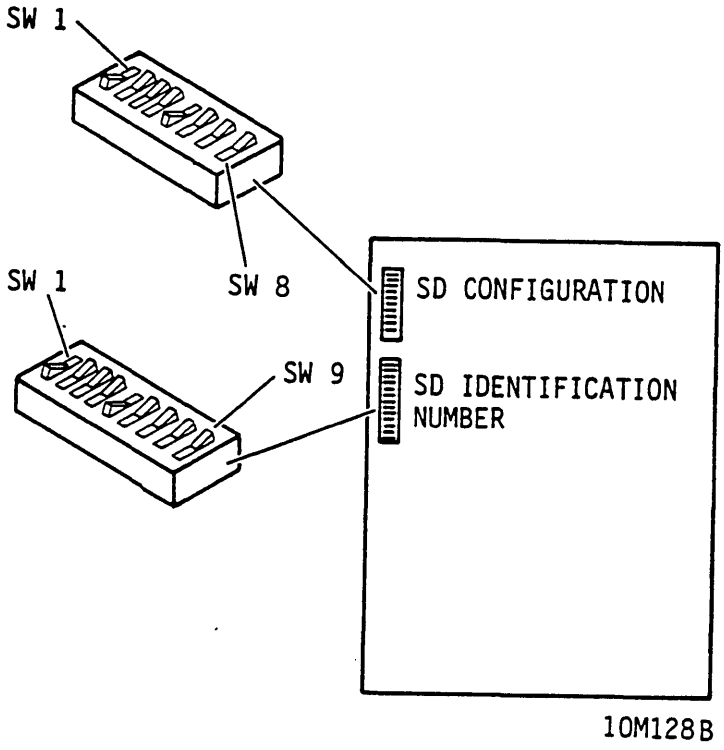


Figure 2D-9. Director to Device Controller Boards

Storage Director Identification Number Switch Setting

The SD Identification Number switches (figure 2D-9) contain the SD identification number, which is readable by both the storage director and the diagnostic processor. The storage director identification number is a unique number assigned to each storage director. In the event of a malfunction, this number is stored with the sense bytes. It is also stored by the diagnostic processor in the storage director error log on the floppy when a hard stop occurs in the storage director. Set the switches as follows:

Switches 1-8 Select an identification number in the range 00-FF with site personnel at the time of installation. Enter the hexadecimal equivalent in the individual switches.

Switch 9 Set switch ON for odd parity of the other eight switches.

SD Configuration Switch Setting

These switches (figure 2D-9) contain miscellaneous storage director information that is read only by the diagnostic processor. Ignore toggle switches 3 through 6 and set the remaining toggle switches as follows:

NOTE

After switches are set or changed, an IML must be executed. New settings will be ignored until IML is completed.

Switch 1: Selects which functional will be loaded. Notice the label on the floppy has two functionals (FUNC) listed. Set switch OFF to select first functional listed. Set switch ON to select the second functional listed.

Switch 2: Set OFF. When switch is set ON, hardcore testing is bypassed.

Switch 7: In Mod 1 units, set switch ON when sequential addressing is selected.

In Mod 3 units, set switch ON when devices are in 2 x 16 mode.

Switch 8: In Mod 1 units, set switch ON if the dual volume reserve/release feature (DVRR) is installed in any controller attached to this storage director.

In Mod 3 units, set switch ON when devices are in 2 x 16 mode.

CHANNEL INTERFACE BOARD

There is one Channel Interface board (_RCX board) for each channel. The Channel A board is at location 01 of the I/O Logic, Channel B is at 02, up through Channel H at 08. Each

card has three switches (figure 2D-10). The top two switches control channel addressing and the bottom switch selects the channel selection priority. This procedure must be repeated for each channel.

Channel Addressing Switches

NOTE

After switches are set or changed, an IML must be executed. New settings will be ignored until IML is completed.

You should be thoroughly familiar with the specific planned configuration of all units in the subsystem, including the total number of address paths to each logical volume, as well as the actual addresses that the customer wants to use. This information is contained in the Installation Planning Configurator worked out beforehand by the customer and the CDC sales representative, and should be readily available.

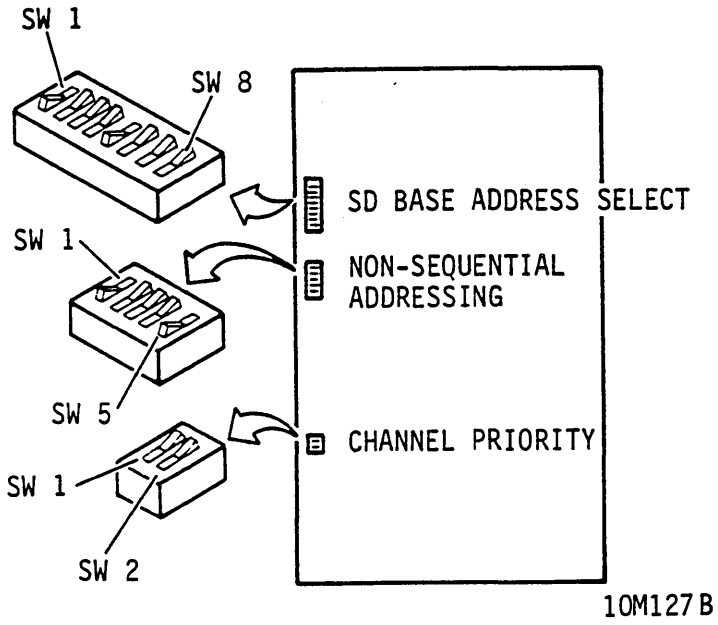


Figure 2D-10. Channel Interface Board

If the storage control is to be connected to a block multiplexer channel, the unit control words (UCWs) must be wired for unshared operation. Check to ensure that the customer has performed this operation and that UCWs are properly wired.

NOTE

All System/370 channels attached to Models 155-II and above are normally wired for unshared operation. Models below this number are normally wired for shared operation unless previously connected to IBM 3330, 3340, or 3350-type devices. If attached to a selector channel, UCW assignments may be ignored.

In Mod 3 units the top switch block serves a dual purpose for both the address and the volume select. The volume select should be set to the lowest possible value that will support your configuration. For example, for four volumes set the switch to 8 volumes and for twelve volumes set the switch to 16 volumes. In all cases the volumes selected should be equal to or less than the block of UCWs selected. If more volumes that UCWs exist, you will experience missing interrupts.

If Mod 2 or Mod 3 is being installed, then Blk Mux and Data Streaming must be specified at the same time when assigning UCWs for the 33800. It is true Blk Mux on large systems default to unshared or Blk Mux mode. But when Data Streaming is specified and Blk Mux isn't Selected also (assuming it will default), then channel overruns occur.

Address Decode

NOTE

The following discussion is background information. You need not read it to set up the addressing and may proceed directly to the Address Switch Settings Procedure.

The combined effects of the SD Base Address Select switch and the Non-Sequential Address switch control the decode of the bits on channel Bus Out when it raises Address Out. In addition, the SD Base Address Select switch sets the SD address for Bus In during a Disconnect-In sequence.

The logic on the _RCX board decodes Bus Out Bits 0 through 4. When these bits have the 0/1 pattern matching the selected configuration of the addressing switches, the board generates Address Compare. The microprogram manipulates the remaining bits to control further subsystem address decoding.

There is a difference between contiguous addresses and sequential addresses:

> Contiguous addresses occur when there is no gap in device addresses in strings attached to the same channel. For example, consider a 16-volume FMD subsystem. Contiguous addresses could have hexadecimal addresses 00-07 on one string and addresses 08-0F on another string. Note that there is no address gap between the 07 and the 08. Noncontiguous addresses would have 00-07 and 20-27 on the same string. The gap in addresses is obvious.
>
> Subsystems with sequential addressing use Bus Out Bit 7 to select the volume: 0=primary; 1=secondary. Therefore, the addresses differ by one. Nonsequential subsystems use Bit 2 to define the volume. This means that the address differs by 20_{16} (32_{10}). Typical address formats are as follows:
>
> Sequential addressing: S S C C D D D V
>
> Nonsequential addressing: S S V C C D D D
>
> Where: S=SD address bits
> C=String controller address bits
> V=Volume select bit
> D=Device address bits

Do not confuse nonsequential addressing with the Non-Sequential Address switch. The Non-Sequential Address switch is used to select noncontiguous groups of addresses to fit into an existing customer configuration. Keep the following general principles in mind:

- DSU subsystems have sequential and contiguous addresses.
- FMD subsystems using sequential addressing always have contiguous addresses. When sequential addressing is

selected, toggle 7 of the SD Configuration switch (_RJX board) was set ON in the previous procedure.

- Dual-volume FMD nonsequential subsystems (with less than 64 volumes) always have noncontiguous addresses. When nonsequential addressing is selected, toggle 7 of the SD Configuration switch (_RJX board) was set OFF in the previous procedure.

- Single-volume FMD subsystems may have either contiguous or noncontiguous addresses.

In turn, the SD Base Address Select switch performs three functions:

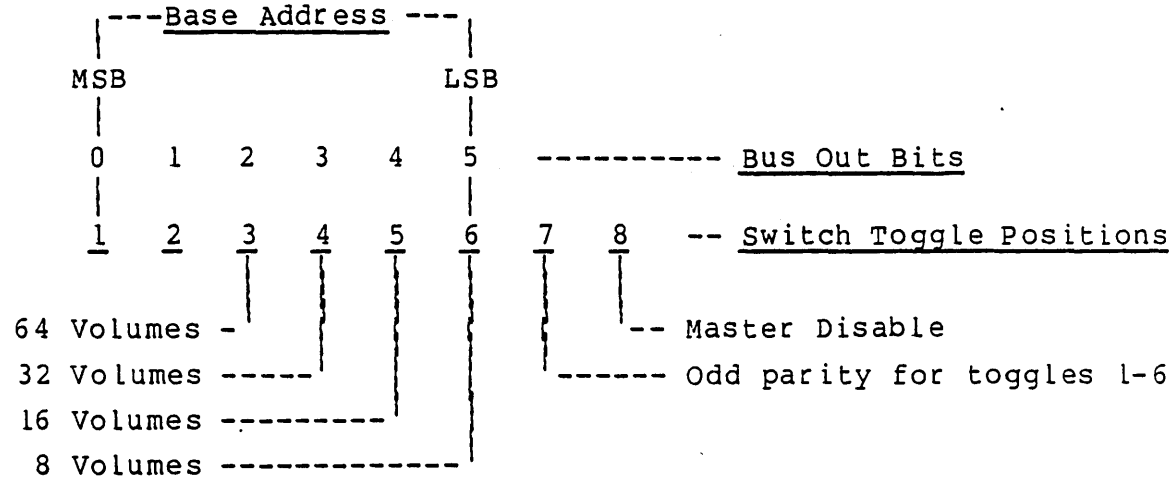
1. Contains the SD portion of the channel address for this particular channel.

2. Contains the drive address select range in logical volumes.

3. Contains a master disable switch for this channel interface.

Addressing with Contiguous Addresses

When all strings attached to a channel have contiguous addresses, the toggle positions of the SD Base Address Select switch have the following definitions:



The rules for setting up contiguous addresses are as follows:

1. Only one logical volume switch may be set. All switch toggles to the right of the selected volume switch must be off.

2. Switch toggles to the left of the logical volume toggle become the SD base address.

   Example: If 32 volumes are selected (switch toggle 4 set), then switch toggles 1, 2, and 3 provide the SD base address. Switch toggles 5 and 6 must be off.

3. Switch toggle 7 selects odd parity for the first six toggles.

4. Switch toggle 8 is a master disable control for that channel. When ON, it forces propagation of Select Out.

5. The five switch toggles of the Non-Sequential Address switch are set to their default value of 11001.

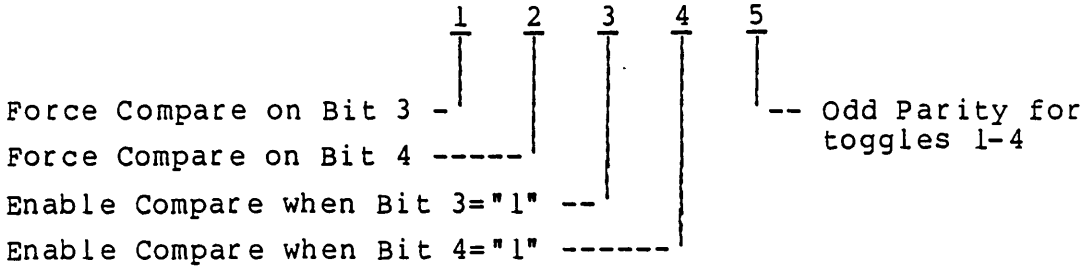
Addressing with Noncontiguous Addresses

The Non-Sequential Address switch controls addressing when addresses are noncontiguous.

NOTE

This discussion assumes that the subsystem contains FMDs. DSU subsystems normally use contiguous addressing only.

The Non-Sequential Address switch controls the decoding of channel Bus Out Bits 3 and 4. The toggle positions of this switch have the following definitions:



The SD Base Address Select switch basically controls the decode of Bus Out Bits 0 through 4. Bits 5 through 7 are not decoded by the SD; they are decoded by the controller/device.

- Bus Out Bits 0 and 1 are always part of the SD base address. SD Base Address Select switch toggles 1 and 2 decode these bits. When ON, Address Compare is partially enabled if the corresponding Bus Out Bit is a "1."

- Bus Out Bits 2, 3, and 4 are selectively decoded within the SD. They may be decoded or ignored, depending upon the subsystem volume configuration.

- Bus Out Bit 2 is controlled by the SD Base Address Select switch toggle 3. Switch toggles 4, 5, and 6 must be OFF; switch toggles 1 and 2 are the SD base address.

- Bus Out Bit 3 is controlled by SD Base Address Select switch toggle 4. Positions 5 and 6 are OFF; toggles 1, 2, and 3 are the SD base address. With this switch ON for noncontiguous addresses, the Non-Sequential Address switch controls Bus Out Bit 3 decoding. The effects are:

Toggle 1	Toggle 3
ON =Ignore Bit 3	Must be OFF
OFF=Decode Bit 3	OFF=Decode Bit 3 as "0" ON =Decode Bit 3 as "1"

- Bus Out Bit 4 is controlled by SD Base Address Select switch toggle 5. Position 6 is OFF; toggles 1 through 4 are the SD base address. With this switch ON for noncontiguous addresses, the Non-Sequential Address switch controls Bus Out Bit 4 decoding. The effects are:

Toggle 2	Toggle 4
ON =Ignore Bit 4	Must be OFF
OFF=Decode Bit 4	OFF=Decode Bit 4 as "0" ON =Decode Bit 4 as "1"

- Bus Out Bit 5 is controlled by SD Base Address Select switch toggle 6.

SD Base Address Select switch toggle 7 selects odd/even parity for switches 1 through 6. Always set it for odd parity. Toggle 8 is a master disable control for that channel. When ON, it forces propagation of Select Out.

Non-Sequential Address switch toggle 5 selects odd parity for switch toggles 1 through 4.

Table 2D-4 provides a listing of commonly used addresses in FMD subsystems. For other address ranges, the least complicated addressing scheme is as follows:

1. Set the Non-Sequential Address switch to its default setting (11001).

2. Select a contiguous group of addresses.

3. Select the number of logical volumes that are to be addressed. Set the corresponding SD Base Address Select switch toggle to the ON position.

4. Set the lower-numbered toggles in the SD Base Address Select switch to the base address of the group of selected addresses selected in step 2.

5. Set odd parity in SD Base Address Select switch toggle 7.

6. Attempt to IML the subsystem. The microcode will not configure the channel if an invalid address is set into the SD Base Address Select switch.

Address Switch Settings Procedure

Perform this procedure for all channels on both SDs. Proceed as follows:

1. Perform Step 1 (Basic Factfinding) of Appendix A to determine that the selected addresses are legal. All channel boards, whether they are used or not, must have the same volume format (1 x 16, 2 x 8, etc.). Addresses may be different, but the volume groups must be the same on a storage director.

2. For Mod 1/FMD subsystems only:

   a. Perform Step 2 (Storage Control Addressing) of Appendix A. This will lead you to the applicable sheet of figure A-1 in Appendix A. Make sure to verify that the selected addresses meet all of the requirements of Step 2.

NOTE

Ignore figure A-1 switch settings.

   b. Refer to the first column in table 2D-4 to find the figure A-1 sheet that you just came from.

   c. Set the switches on the SD Base Address Select switch and the Non-Sequential Address switch in accordance with table 2D-4 for the selected address range.

3. For Mod 3/DSU subsystems only: Set the switches on the SD Base Address Select switch and the Non-Sequential Address switch in accordance with table 2D-5.

Channel Priority Switch

This two-toggle switch controls whether the storage director samples the Select Out or Select In channel interface signals. Both toggles must always be set the same. High Priority picks Select Out while Low Priority picks Select In.

Refer to the IBM System/370 Interface OEM Information Manual (Publication Number GA22-6974) for a more detailed description of channel priority.

TABLE 2D-4. ADDRESS SWITCH SETTINGS FOR FMD SUBSYSTEMS (Contd)

Fig A-1 Sheet	Vol	Address Range Min	Address Range Max	SD Base Address 1	2	3	4	5	6	7	8*	Non-Sequential 1	2	3	4	5
*= Set toggle in OFF position to enable channel. 0= OFF 1= ON																
14	2 x 16 (Seq)	00	0F	0	0	1	0	0	0	0	0	1	1	0	0	1
		20	2F	0	0	1	0	0	0	0	0	1	1	0	0	1
		10	1F	0	0	1	0	0	0	0	0	1	1	0	0	1
		30	3F	0	0	1	0	0	0	0	0	1	1	0	0	1
		40	4F	0	1	1	0	0	0	1	0	1	1	0	0	1
		60	6F	0	1	1	0	0	0	1	0	1	1	0	0	1
		50	5F	0	1	1	0	0	0	1	0	1	1	0	0	1
		70	7F	0	1	1	0	0	0	1	0	1	1	0	0	1
		80	8F	1	0	1	0	0	0	1	0	1	1	0	0	1
		A0	AF	1	0	1	0	0	0	1	0	1	1	0	0	1
		90	9F	1	0	1	0	0	0	1	0	1	1	0	0	1
		B0	BF	1	0	1	0	0	0	1	0	1	1	0	0	1
		C0	CF	1	1	1	0	0	0	0	0	1	1	0	0	1
		E0	EF	1	1	1	0	0	0	0	0	1	1	0	0	1
		D0	DF	1	1	1	0	0	0	0	0	1	1	0	0	1
		F0	FF	1	1	1	0	0	0	0	0	1	1	0	0	1

TABLE 2D-5. ADDRESS SWITCH SETTINGS FOR DSU SUBSYSTEMS

Volumes	Address Range		SD Base Address								Non-Sequential					HSC
	Min	Max	1	2	3	4	5	6	7	8 *	1	2	3	4	5	Address
*= Set toggle in OFF position to enable channel. 0= OFF 1= ON																
8	00	07	0	0	0	0	0	1	0	0	1	1	0	0	1	0
	10	17	0	0	0	1	0	1	1	0	1	1	0	0	1	1
	20	27	0	0	1	0	0	1	1	0	1	1	0	0	1	0
	30	37	0	0	1	1	0	1	0	0	1	1	0	0	1	1
	40	47	0	1	0	0	0	1	1	0	1	1	0	0	1	0
	50	57	0	1	0	1	0	1	0	0	1	1	0	0	1	1
	60	67	0	1	1	0	0	1	0	0	1	1	0	0	1	0
	70	77	0	1	1	1	0	1	1	0	1	1	0	0	1	1
	80	87	1	0	0	0	0	1	1	0	1	1	0	0	1	0
	90	97	1	0	0	1	0	1	0	0	1	1	0	0	1	1
	A0	A7	1	0	1	0	0	1	0	0	1	1	0	0	1	0
	B0	B7	1	0	1	1	0	1	1	0	1	1	0	0	1	1
	C0	C7	1	1	0	0	0	1	0	0	1	1	0	0	1	0
	D0	D7	1	1	0	1	0	1	1	0	1	1	0	0	1	1
	E0	E7	1	1	1	0	0	1	1	0	1	1	0	0	1	0
	F0	F7	1	1	1	1	0	1	0	0	1	1	0	0	1	1

Table Continued on Next Page

TABLE 2D-5. ADDRESS SWITCH SETTINGS FOR DSU SUBSYSTEMS (Contd)

Volumes	Address Range		SD Base Address								Non-Sequential					HSC
	Min	Max	1	2	3	4	5	6	7	8*	1	2	3	4	5	Address
*= Set toggle in OFF position to enable channel. 0= OFF 1= ON																
16	00	0F	0	0	0	0	1	0	0	0	1	1	0	0	1	0
	10	1F	0	0	0	1	1	0	1	0	1	1	0	0	1	1
	20	2F	0	0	1	0	1	0	1	0	1	1	0	0	1	0
	30	3F	0	0	1	1	1	0	0	0	1	1	0	0	1	1
	40	4F	0	1	0	0	1	0	1	0	1	1	0	0	1	0
	50	5F	0	1	0	1	1	0	0	0	1	1	0	0	1	1
	60	6F	0	1	1	0	1	0	0	0	1	1	0	0	1	0
	70	7F	0	1	1	1	1	0	1	0	1	1	0	0	1	1
	80	8F	1	0	0	0	1	0	1	0	1	1	0	0	1	0
	90	9F	1	0	0	1	1	0	0	0	1	1	0	0	1	1
	A0	AF	1	0	1	0	1	0	0	0	1	1	0	0	1	0
	B0	BF	1	0	1	1	1	0	1	0	1	1	0	0	1	1
	C0	CF	1	1	0	0	1	0	0	0	1	1	0	0	1	0
	D0	DF	1	1	0	1	1	0	1	0	1	1	0	0	1	1
	E0	EF	1	1	1	0	1	0	1	0	1	1	0	0	1	0
	F0	FF	1	1	1	1	1	0	0	0	1	1	0	0	1	1

Table Continued on Next Page

TABLE 2D-5. ADDRESS SWITCH SETTINGS FOR DSU SUBSYSTEMS (Contd)

Volumes	Address Range		SD Base Address								Non-Sequential					HSC
	Min	Max	1	2	3	4	5	6	7	8 *	1	2	3	4	5	Address
*= Set toggle in OFF position to enable channel. 0= OFF 1= ON																
32	00	1F	0	0	0	1	0	0	0	0	1	1	0	0	1	0,1
	20	3F	0	0	1	1	0	0	1	0	1	1	0	0	1	0,1
	40	5F	0	1	0	1	0	0	1	0	1	1	0	0	1	0,1
	60	7F	0	1	1	1	0	0	0	0	1	1	0	0	1	0,1
	80	9F	1	0	0	1	0	0	1	0	1	1	0	0	1	0,1
	A0	BF	1	0	1	1	0	0	0	0	1	1	0	0	1	0,1
	C0	DF	1	1	0	1	0	0	0	0	1	1	0	0	1	0,1
	E0	FF	1	1	1	1	0	0	1	0	1	1	0	0	1	0,1

MICROPROGRAM FLEXIBLE DISK

NOTE

When new disk is installed, press DP Reset on the DP board (_KEX Board).

The functional microprogram, storage director, controller, and device test and utility programs are on one flexible disk. Table 2D-6 lists the available microprograms for this subsystem.

TABLE 2D-6. FA16x MICROPROGRAM LISTING

SUPPORTED CONFIGURATIONS	CDC Storage Control	
	Mod 1	Mod 3
One Channel Basic	Yes	Yes
Two Channel Option	Yes	Yes
Four Channel Option	Yes	Yes
Eight Channel Option	Yes	Yes
CDC/IBM 3330-Type Devices	No	No
CDC 33801/3350X-Type Devices	*	No
3330X String Switch	No	No
33801/3350X String Switch	Yes	No
3330X Dual Access	No	No
33801/3350X Dual Access	Yes	No
Dual Volume	Yes	No
Dynamic Path Selection	No	Yes
16 Volume Enhancement	No	No
IBM 3350-Type Devices	*	No
Sequential Addressing	Yes	No
Dual Volume Reserve/Release	Yes	No
Storage Control Diagnostics	Yes	Yes
Inline Diagnostics	Yes	Yes
Speed Matching Buffer	No	Yes
*Yes, with Revision E		

DISKS:	Disk Part Number	Name
	728884xx	Disk Assembly - 38800/3350x/3380x (MF126H)

INITIAL STARTUP AND TESTING

NOTE

Before putting subsystems having the DPS feature (FV716-C, D; FV7A5-C, D, G, & H) online, refer to the storage control's Hardware Diagnostic Reference Manual (publication number 83324410) for the DPS Array Procedures and Precautions.

Initial startup and testing requires installation of some channel and controller interface simulators, installation of a flexible disk, and application of power. Perform the following steps.

1. Install terminators on all controller connectors for both storage directors, if not already installed. See I/O Cable Installation for terminator part numbers, and figure 2D-4 for connector locations.

2. Install simulators in all eight controller EPO connectors PC-9 through PC-16 and in CPU EPO connector PC-1, if not already installed. See EPO Cable Installation for terminator part numbers, and figure 2D-4 for connector locations.

3. Insert the flexible disk and set the power control unit and power panel switches to power up locally as shown in the hardware reference manual, with the exception that the power panel DEVICE SEQUENCE switch is set to DISABLE.

   The storage director conducts microprogram-controlled self testing and indicates the result as follows:

No errors detected:	POWER SEQ COMPLETE and WAIT lights on the operator control panel.
Errors detected:	DP CHECK or HOST CHECK lights on the maintenance panel; POWER CHECK or CHECK lights on the operator panel. Proceed to the Hardware Diagnostic Reference manual for problem analysis and repair procedure.

The following operator panel indications occur if the SD Base Address Select switch toggles are incorrectly set:

- For Mod 1 units, microprogram turns on CHANNEL ENABLE indicators, but does not turn on any status indicators.

- For Mod 3 units, microprogram hangs with PROCESS indicator on, but does not turn on any CHANNEL ENABLE indicators.

4. During the power-up sequence hardcore diagnostic testing is automatically performed.

5. Perform CTL-I Wrap Around and Channel Wrap Around test described in the Hardware Diagnostic Reference manual.

6. Turn off the UNIT POWER switch on the power control unit.

7. Remove the CPU EPO simulator from PC-1. Connect an EPO cable to PC-1 through PC-8 from each CPU served by either storage director. Each CPU requires one EPO cable for each storage control.

8. Remove from connectors PC-9 through PC-12 the same number of EPO simulators as controllers to be attached to storage director 1. Attach the controller EPO cables in the open connectors in the desired power-up sequence, starting with connector PC-9. Repeat for connectors PC-13 through PC-16 and storage director 2. Do not remove controller EPO simulators from any unassigned EPO connectors.

9. Attach controller tag and bus cables to both storage directors. See I/O Cable Installation for cable lengths and part numbers.

SPECIAL TOOLS AND TEST EQUIPMENT

A list of recommended tools and test equipment is provided in table 2D-7. Table 2D-8 provides CTL/DDC/Channel Wrap Cable usage information.

TABLE 2D-7. MAINTENANCE TOOLS

Description	Part Number
Card Extender, 140 Pak	CDC 83633016
Chip Insertion/Extraction Tool	CDC 12263637
Conductive Static Shielding Bags:	
(5 x 8)	CDC 12263624
(8 x 12)	CDC 12263625
(10 x 12)	CDC 12263626
(14 x 18)	CDC 12263499
(16 x 24)	CDC 12263627
Terminal	12263658 (Silent 700 Model 703 KSR)
Terminal Carry Case	12263659
Terminal RS232 Cable	12263660
Card Guide	CDC 82320400
IC Test Clip	AP 923700
Modem RS232C Cable	12263661
Modem RS232C Cable	12263662
Oscilloscope	Tektronix 454 or equivalent
Oscilloscope Hood	Tektronix 016-0154-00
Oscilloscope Patch Cords (2)	H.H. Smith 1588-60
Oscilloscope Probe Tip	CDC 12212885
Volt/ohmmeter	Simpson 260 or equivalent
Wrist Straps:	
Small	CDC 12263623
Large	CDC 12263496
Wrist Strap Tester	75446450

TABLE 2D-8. CTL-I/DDC/CHANNEL WRAP CABLE USAGE

Part Number	Cable Name	Storage Control Units
73683405 (Short Cable) 73683408 (Long Cable)	Channel Wrap	FA161, FA162 - Mod 1 side (Without 8-channel switch)
73683406 *	DDC Wrap	FA162-Mod 3 side, FA163
73683407	CTL-I Wrap	FA161, FA162 - Mod 1 side
83645521 *	CTL-I Wrap	FA161, FA162 - Mod 1 side (Used with _UTX board from channel wrap part number 83633870)
83633871 *	Channel Wrap Assembly	FA161, FA162 - Mod 1 side (Used on 8-channel switch). Mod 3 storage directors require _RJX in slot 13 of I/O chassis.
*Preferred cables for testing		

SECTION 3

IBM STORAGE CONTROL INSTALLATION

SECTION 4

CDC CONTROLLER/DRIVE INSTALLATION

CDC CONTROLLER/DRIVE INSTALLATION 4

INTRODUCTION

The controller contains the logic required to interpret control signals from the storage control and determine the pattern of data sent to the drive. The drive stores and retrieves data. The controller and drive return status information to the storage control to ensure that all operations are properly performed.

CONTROLLER PRODUCT NUMBERS

Refer to table 4-1 for a description of CDC controller units.

DRIVE PRODUCT NUMBERS

Tables 4-2 through 4-5 provide a description of CDC end-user and OEM drive units.

Table 4-2 applies to the HPDs. Installation procedures for these units are in section 4A.

Table 4-3 applies to FMDs that are incapable of having the Dual Access Feature (DAF) installed. Installation procedures for these units are in section 4B.

Table 4-4 lists FMDs that either have DAF installed, or are capable of a field-upgrade to add DAF. The "Interface Switch" column in that table has the following meaning: an SS means that String Switch is installed; DVRR means that Dual Volume Reserve/Release is installed; Neither means that neither SS nor DVRR is installed. Installation procedures without DVRR are in section 4C; units with DVRR are covered in section 4D.

Table 4-5 lists DSUs. Installation procedures are in section 4E.

INSTALLATION CHECK LIST

The installation check list (table 4-6) is for experienced service personnel to use as a guide in performing installation checks. More detailed information is provided in each of the controller/drive subsections.

TABLE 4-1. CDC CONTROLLER TYPES

Product Number	Equipment Number	Storage Control Access Paths	Drive Access Paths*	Operating Frequency
33332-1 CAU	FV605-A FV605-B FV605-D FV605-E	One	One	60 Hz 50 Hz 60 Hz 50 Hz
33332-2 CAU	FV605-F FV605-G	Two	One	60 Hz 50 Hz
33332-3 CAU	FV605-K FV605-L	One	Two	60 Hz 50 Hz
33332-4 CAU	FV605-M FV605-N	Two	Two	60 Hz 50 Hz
FMC**	BZ6XX BZ8XX	One/Two***	One/ Two****	60 Hz 50 Hz
33800-A HSC 90380-1 HSC	FV716-A FV716-B FA7A5-A FA7A5-B	One	Four Disk Storage Units (16 logical addresses)	60 Hz 50 Hz 60 Hz 50 Hz

Table Continued on Next Page

TABLE 4-1. CDC CONTROLLER TYPES (Contd)

Product Number	Equipment Number	Storage Control Access Paths	Drive Access Paths*	Operating Frequency
33800-AA	FV716-C	Two	Four Disk	60 Hz
HSC	FV716-D		Storage Units	50 Hz
90380-2	FA7A5-C		(16 logical	60 Hz
HSC	FA7A5-D		addresses)	50 Hz

Notes

* Each drive access path can interface up to 8 drives.

** Controller contained within drive unit. Refer to "A2" units in tables 4-3 and 4-4.

*** Two storage control access paths on string switch units only.

**** Two drive access paths on DAF units only.

TABLE 4-2. CDC HIGH PERFORMANCE DRIVE (HPD) UNITS

Product/Equipment Number	Channels	Frequency (Hz)	Description
33301 BR501-A	1	60	Bolt-together
33301 BR501-B	1	50	Bolt-together
33301 BR502-A	2	60	Both-together
33301 BR502-B	2	50	Bolt-together
33301 BR503-A	1	60	Standalone
33301 BR503-B	1	50	Standalone
33301 BR504-E	2	60	Standalone
33301 BR504-D	2	50	Standalone
33302-1 BR306-A	1	60	Standalone
33302-1 BR306-B	1	50	Standalone
33302-1 BR306-E	1	60	Standalone
33302-1 BR306-D	1	50	Standalone

Table Continued on Next Page

TABLE 4-2. CDC HIGH PERFORMANCE DRIVE (HPD) UNITS (Contd)

Product/Equipment Number	Channels	Frequency (Hz)	Description
33302-1 BR307-E	2	60	Standalone
33302-1 BR307-D	2	50	Standalone
33302-11 BR310-A	1	60	Standalone
33302-11 BR310-B	1	50	Standalone
33302-11 BR310-C	1	60	Standalone
33302-11 BR310-D	1	50	Standalone
33302-11 BR311-A	2	60	Standalone
33302-11 BR311-B	2	50	Standalone

TABLE 4-3. CDC NON-DAF CAPABLE FMD UNITS

Equipment Number	Frequency (Hz)	Fixed Heads	String Switch	16/8 Device Capability
33801 A2 Models				
BZ601-A	60	No	No	No
BZ601-B	50	No	No	No
BZ601-C	60	Yes	No	No
BZ601-D	50	Yes	No	No
BZ601-E	60	No	Yes	No
BZ601-F	50	No	Yes	No
BZ601-G	60	Yes	Yes	No
BZ601-H	50	Yes	Yes	No
33502 A2 Models				
BZ602-A	60	No	No	No
BZ602-B	50	No	No	No
BZ602-C	60	Yes	No	No
BZ602-D	50	Yes	No	No
BZ602-E	60	No	Yes	No
BZ602-F	50	No	Yes	No
BZ602-G	60	Yes	Yes	No
BZ602-H	50	Yes	Yes	No

Table Continued on Next Page

TABLE 4-3. CDC NON-DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	String Switch	16/8 Device Capability
33501 A2 Models				
BZ606-A	60	No	No	No
BZ606-B	50	No	No	No
BZ606-C	60	Yes	No	No
BZ606-D	50	Yes	No	No
BZ606-E	60	No	Yes	No
BZ606-F	50	No	Yes	No
BZ606-G	60	Yes	Yes	No
BZ606-H	50	Yes	Yes	No
33801 B2 Models				
BZ701-A	60	No	Not	Not
BZ701-B	50	No	Applicable	Applicable
BZ701-C	60	Yes		
BZ701-D	50	Yes		
33502 B2 Models				
BZ702-A	60	No	Not	Not
BZ702-B	50	No	Applicable	Applicable
BZ702-C	60	Yes		
BZ702-D	50	Yes		

Table Continued on Next Page

TABLE 4-3. CDC NON-DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	String Switch	16/8 Device Capability
33501 B2 Models				
BZ706-A	60	No	Not	Not
BZ706-B	50	No	Applicable	Applicable
BZ706-C	60	Yes		
BZ706-D	50	Yes		

TABLE 4-4. CDC DAF CAPABLE FMD UNITS

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
33801 A2 Models (800 MB)					
BZ604-A	60	No	Neither	No	No
BZ604-B	50	No	Neither	No	No
BZ604-C	60	Yes	Neither	No	No
BZ604-D	50	Yes	Neither	No	No
BZ604-E	60	No	SS	No	No
BZ604-F	50	No	SS	No	No
BZ604-G	60	Yes	SS	No	No
BZ604-H	50	Yes	SS	No	No
BZ604-J	60	No	Neither	Yes	No
BZ604-K	50	No	Neither	Yes	No
BZ604-L	60	Yes	Neither	Yes	No
BZ604-M	50	Yes	Neither	Yes	No
BZ604-N	60	No	SS	Yes	No
BZ604-P	50	No	SS	Yes	No
BZ604-R	60	Yes	SS	Yes	No
BZ604-S	50	Yes	SS	Yes	No
BZ614-A	60	No	Neither	No	Yes
BZ614-B	50	No	Neither	No	Yes
BZ614-C	60	Yes	Neither	No	Yes
BZ614-D	50	Yes	Neither	No	Yes
BZ614-E	60	No	SS	No	Yes
BZ614-F	50	No	SS	No	Yes
BZ614-G	60	Yes	SS	No	Yes

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ614-H	50	Yes	SS	No	Yes
BZ614-J	60	No	Neither	Yes	Yes
BZ614-K	50	No	Neither	Yes	Yes
BZ614-L	60	Yes	Neither	Yes	Yes
BZ614-M	50	Yes	Neither	Yes	Yes
BZ614-N	60	No	SS	Yes	Yes
BZ614-P	50	No	SS	Yes	Yes
BZ614-R	60	Yes	SS	Yes	Yes
BZ614-S	50	Yes	SS	Yes	Yes
BZ624-A	60	No	DVRR	No	Yes
BZ624-B	50	No	DVRR	No	Yes
BZ624-C	60	Yes	DVRR	No	Yes
BZ624-D	50	Yes	DVRR	No	Yes
BZ624-J	60	No	DVRR	Yes	Yes
BZ624-K	50	No	DVRR	Yes	Yes
BZ624-L	60	Yes	DVRR	Yes	Yes
BZ624-M	50	Yes	DVRR	Yes	Yes
33501 A2 Models (635 MB)					
BZ607-A	60	No	Neither	No	No
BZ607-B	50	No	Neither	No	No
BZ607-C	60	Yes	Neither	No	No
BZ607-D	50	Yes	Neither	No	No
BZ607-E	60	No	SS	No	No

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ607-F	50	No	SS	No	No
BZ607-G	60	Yes	SS	No	No
BZ607-H	50	Yes	SS	No	No
BZ607-J	60	No	Neither	Yes	No
BZ607-K	50	No	Neither	Yes	No
BZ607-L	60	Yes	Neither	Yes	No
BZ607-M	50	Yes	Neither	Yes	No
BZ607-N	60	No	SS	Yes	No
BZ607-P	50	No	SS	Yes	No
BZ607-R	60	Yes	SS	Yes	No
BZ607-S	50	Yes	SS	Yes	No
BZ617-A	60	No	Neither	No	Yes
BZ617-B	50	No	Neither	No	Yes
BZ617-C	60	Yes	Neither	No	Yes
BZ617-D	50	Yes	Neither	No	Yes
BZ617-E	60	No	SS	No	Yes
BZ617-F	50	No	SS	No	Yes
BZ617-G	60	Yes	SS	No	Yes
BZ617-H	50	Yes	SS	No	Yes
BZ617-J	60	No	Neither	Yes	Yes
BZ617-K	50	No	Neither	Yes	Yes
BZ617-L	60	Yes	Neither	Yes	Yes
BZ617-M	50	Yes	Neither	Yes	Yes
BZ617-N	60	No	SS	Yes	Yes
BZ617-P	50	No	SS	Yes	Yes

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ617-R	60	Yes	SS	Yes	Yes
BZ617-S	50	Yes	SS	Yes	Yes
BZ627-A	60	No	DVRR	No	Yes
BZ627-B	50	No	DVRR	No	Yes
BZ627-C	60	Yes	DVRR	No	Yes
BZ627-D	50	Yes	DVRR	No	Yes
BZ627-J	60	No	DVRR	Yes	Yes
BZ627-K	50	No	DVRR	Yes	Yes
BZ627-L	60	Yes	DVRR	Yes	Yes
BZ627-M	50	Yes	DVRR	Yes	Yes
33502 A2 Models (1270 MB)					
BZ605-A	60	No	Neither	No	No
BZ605-B	50	No	Neither	No	No
BZ605-C	60	Yes	Neither	No	No
BZ605-D	50	Yes	Neither	No	No
BZ605-E	60	No	SS	No	No
BZ605-F	50	No	SS	No	No
BZ605-G	60	Yes	SS	No	No
BZ605-H	50	Yes	SS	No	No
BZ605-J	60	No	Neither	Yes	No
BZ605-K	50	No	Neither	Yes	No
BZ605-L	60	Yes	Neither	Yes	No
BZ605-M	50	Yes	Neither	Yes	No

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ605-N	60	No	SS	Yes	No
BZ605-P	50	No	SS	Yes	No
BZ605-R	60	Yes	SS	Yes	No
BZ605-S	50	Yes	SS	Yes	No
BZ615-A	60	No	Neither	No	Yes
BZ615-B	50	No	Neither	No	Yes
BZ615-C	60	Yes	Neither	No	Yes
BZ615-D	50	Yes	Neither	No	Yes
BZ615-E	60	No	SS	No	Yes
BZ615-F	50	No	SS	No	Yes
BZ615-G	60	Yes	SS	No	Yes
BZ615-H	50	Yes	SS	No	Yes
BZ615-J	60	No	Neither	Yes	Yes
BZ615-K	50	No	Neither	Yes	Yes
BZ615-L	60	Yes	Neither	Yes	Yes
BZ615-M	50	Yes	Neither	Yes	Yes
BZ615-N	60	No	SS	Yes	Yes
BZ615-P	50	No	SS	Yes	Yes
BZ615-R	60	Yes	SS	Yes	Yes
BZ615-S	50	Yes	SS	Yes	Yes
BZ625-A	60	No	DVRR	No	Yes
BZ625-B	50	No	DVRR	No	Yes
BZ625-C	60	Yes	DVRR	No	Yes
BZ625-D	50	Yes	DVRR	No	Yes
BZ625-J	60	No	DVRR	Yes	Yes

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ625-K	50	No	DVRR	Yes	Yes
BZ625-L	60	Yes	DVRR	Yes	Yes
BZ625-M	50	Yes	DVRR	Yes	Yes
33801 B2 Models (800 MB)					
BZ704-A	60	No	Not	No	Not
BZ704-B	50	No	Appli-	No	Appli-
BZ704-C	60	Yes	cable	No	cable
BZ704-D	50	Yes		No	
BZ704-E	60	No		Yes	
BZ704-F	50	No		Yes	
BZ704-G	60	Yes		Yes	
BZ704-H	50	Yes		Yes	
33501 B2 Models (635 MB)					
BZ707-A	60	No	Not	No	Not
BZ707-B	50	No	Appli-	No	Appli-
BZ707-C	60	Yes	cable	No	cable
BZ707-D	50	Yes		No	
BZ707-E	60	No		Yes	
BZ707-F	50	No		Yes	
BZ707-G	60	Yes		Yes	
BZ707-H	50	Yes		Yes	

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
33502 B2 Models (1270 MB)					
BZ705-A	60	No	Not	No	Not
BZ705-B	50	No	Appli-	No	Appli-
BZ705-C	60	Yes	cable	No	cable
BZ705-D	50	Yes		No	
BZ705-E	60	No		Yes	
BZ705-F	50	No		Yes	
BZ705-G	60	Yes		Yes	
BZ705-H	50	Yes		Yes	
33801 C2 Models (800 MB)					
BZ804-A	60	No	Neither	No	No
BZ804-B	50	No	Neither	No	No
BZ804-C	60	Yes	Neither	No	No
BZ804-D	50	Yes	Neither	No	No
BZ804-E	60	No	SS	No	No
BZ804-F	50	No	SS	No	No
BZ804-G	60	Yes	SS	No	No
BZ804-H	50	Yes	SS	No	No
BZ804-J	60	No	Neither	Yes	No
BZ804-K	50	No	Neither	Yes	No
BZ804-L	60	Yes	Neither	Yes	No
BZ804-M	50	Yes	Neither	Yes	No

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ804-N	60	No	SS	Yes	No
BZ804-P	50	No	SS	Yes	No
BZ804-R	60	Yes	SS	Yes	No
BZ804-S	50	Yes	SS	Yes	No
BZ814-A	60	No	Neither	No	Yes
BZ814-B	50	No	Neither	No	Yes
BZ814-C	60	Yes	Neither	No	Yes
BZ814-D	50	Yes	Neither	No	Yes
BZ814-E	60	No	SS	No	Yes
BZ814-F	50	No	SS	No	Yes
BZ814-G	60	Yes	SS	No	Yes
BZ814-H	50	Yes	SS	No	Yes
BZ814-J	60	No	Neither	Yes	Yes
BZ814-K	50	No	Neither	Yes	Yes
BZ814-L	60	Yes	Neither	Yes	Yes
BZ814-M	50	Yes	Neither	Yes	Yes
BZ814-N	60	No	SS	Yes	Yes
BZ814-P	50	No	SS	Yes	Yes
BZ814-R	60	Yes	SS	Yes	Yes
BZ814-S	50	Yes	SS	Yes	Yes

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
33501 C2 Models (635 MB)					
BZ807-A	60	No	Neither	No	No
BZ807-B	50	No	Neither	No	No
BZ807-C	60	Yes	Neither	No	No
BZ807-D	50	Yes	Neither	No	No
BZ807-E	60	No	SS	No	No
BZ807-F	50	No	SS	No	No
BZ807-G	60	Yes	SS	No	No
BZ807-H	50	Yes	SS	No	No
BZ807-J	60	No	Neither	Yes	No
BZ807-K	50	No	Neither	Yes	No
BZ807-L	60	Yes	Neither	Yes	No
BZ807-M	50	Yes	Neither	Yes	No
BZ807-N	60	No	SS	Yes	No
BZ807-P	50	No	SS	Yes	No
BZ807-R	60	Yes	SS	Yes	No
BZ807-S	50	Yes	SS	Yes	No
BZ817-A	60	No	Neither	No	Yes
BZ817-B	50	No	Neither	No	Yes
BZ817-C	60	Yes	Neither	No	Yes
BZ817-D	50	Yes	Neither	No	Yes
BZ817-E	60	No	SS	No	Yes
BZ817-F	50	No	SS	No	Yes
BZ817-G	60	Yes	SS	No	Yes

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ817-H	50	Yes	SS	No	Yes
BZ817-J	60	No	Neither	Yes	Yes
BZ817-K	50	No	Neither	Yes	Yes
BZ817-L	60	Yes	Neither	Yes	Yes
BZ817-M	50	Yes	Neither	Yes	Yes
BZ817-N	60	No	SS	Yes	Yes
BZ817-P	50	No	SS	Yes	Yes
BZ817-R	60	Yes	SS	Yes	Yes
BZ817-S	50	Yes	SS	Yes	Yes
33502 C2 Models (1270 MB)					
BZ805-A	60	No	Neither	No	No
BZ805-B	50	No	Neither	No	No
BZ805-C	60	Yes	Neither	No	No
BZ805-D	50	Yes	Neither	No	No
BZ805-E	60	No	SS	No	No
BZ805-F	50	No	SS	No	No
BZ805-G	60	Yes	SS	No	No
BZ805-H	50	Yes	SS	No	No
BZ805-J	60	No	Neither	Yes	No
BZ805-K	50	No	Neither	Yes	No
BZ805-L	60	Yes	Neither	Yes	No
BZ805-M	50	Yes	Neither	Yes	No
BZ805-N	60	No	SS	Yes	No

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ805-P	50	No	SS	Yes	No
BZ805-R	60	Yes	SS	Yes	No
BZ805-S	50	Yes	SS	Yes	No
BZ815-A	60	No	Neither	No	Yes
BZ815-B	50	No	Neither	No	Yes
BZ815-C	60	Yes	Neither	No	Yes
BZ815-D	50	Yes	Neither	No	Yes
BZ815-E	60	No	SS	No	Yes
BZ815-F	50	No	SS	No	Yes
BZ815-G	60	Yes	SS	No	Yes
BZ815-H	50	Yes	SS	No	Yes
BZ815-J	60	No	Neither	Yes	Yes
BZ815-K	50	No	Neither	Yes	Yes
BZ815-L	60	Yes	Neither	Yes	Yes
BZ815-M	50	Yes	Neither	Yes	Yes
BZ815-N	60	No	SS	Yes	Yes
BZ815-P	50	No	SS	Yes	Yes
BZ815-R	60	Yes	SS	Yes	Yes
BZ815-S	50	Yes	SS	Yes	Yes

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
OEM 9776 A2 Models (1270 MB)					
BZ6A1-A	60	No	Neither	No	No
BZ6A1-B	50	No	Neither	No	No
BZ6A1-C	60	Yes	Neither	No	No
BZ6A1-D	50	Yes	Neither	No	No
BZ6A1-E	60	No	SS	No	No
BZ6A1-F	50	No	SS	No	No
BZ6A1-G	60	Yes	SS	No	No
BZ6A1-H	50	Yes	SS	No	No
BZ6A1-J	60	No	Neither	Yes	No
BZ6A1-K	50	No	Neither	Yes	No
BZ6A1-L	60	Yes	Neither	Yes	No
BZ6A1-M	50	Yes	Neither	Yes	No
BZ6A1-N	60	No	SS	Yes	No
BZ6A1-P	50	No	SS	Yes	No
BZ6A1-R	60	Yes	SS	Yes	No
BZ6A1-S	50	Yes	SS	Yes	No
BZ6A2-J	60	No	Neither	No	No
BZ6A2-L	60	Yes	Neither	No	No
BZ6B1-A	60	No	Neither	No	Yes
BZ6B1-B	50	No	Neither	No	Yes
BZ6B1-C	60	Yes	Neither	No	Yes
BZ6B1-D	50	Yes	Neither	No	Yes
BZ6B1-E	60	No	SS	No	Yes

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ6B1-F	50	No	SS	No	Yes
BZ6B1-G	60	Yes	SS	No	Yes
BZ6B1-H	50	Yes	SS	No	Yes
BZ6B1-J	60	No	Neither	Yes	Yes
BZ6B1-K	50	No	Neither	Yes	Yes
BZ6B1-L	60	Yes	Neither	Yes	Yes
BZ6B1-M	50	Yes	Neither	Yes	Yes
BZ6B1-N	60	No	SS	Yes	Yes
BZ6B1-P	50	No	SS	Yes	Yes
BZ6B1-R	60	Yes	SS	Yes	Yes
BZ6B1-S	50	Yes	SS	Yes	Yes
BZ6B2-A	60	No	DVRR	No	Yes
BZ6B2-B	50	No	DVRR	No	Yes
BZ6B2-C	60	Yes	DVRR	No	Yes
BZ6B2-D	50	Yes	DVRR	No	Yes
BZ6B2-J	60	No	DVRR	Yes	Yes
BZ6B2-K	50	No	DVRR	Yes	Yes
BZ6B2-L	60	Yes	DVRR	Yes	Yes
BZ6B2-M	50	Yes	DVRR	Yes	Yes
BZ6B3-A	60	No	Neither	No	No
BZ6B3-B	50	No	Neither	No	No
BZ6B3-C	60	Yes	Neither	No	No
BZ6B3-D	50	Yes	Neither	No	No
BZ6B3-E	60	No	SS	No	No
BZ6B3-F	50	No	SS	No	No

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ6B3-G	60	Yes	SS	No	No
BZ6B3-H	50	Yes	SS	No	No
BZ6B3-J	60	No	Neither	Yes	No
BZ6B3-K	50	No	Neither	Yes	No
BZ6B3-L	60	Yes	Neither	Yes	No
BZ6B3-M	50	Yes	Neither	Yes	No
BZ6B3-N	60	No	SS	Yes	No
BZ6B3-P	50	No	SS	Yes	No
BZ6B3-R	60	Yes	SS	Yes	No
BZ6B3-S	50	Yes	SS	Yes	No
BZ6B4-A	60	No	DVRR	No	No
BZ6B4-B	50	No	DVRR	No	No
BZ6B4-C	60	Yes	DVRR	No	No
BZ6B4-D	50	Yes	DVRR	No	No
BZ6B4-J	60	No	DVRR	Yes	No
BZ6B4-K	50	No	DVRR	Yes	No
BZ6B4-L	60	Yes	DVRR	Yes	No
BZ6B4-M	50	Yes	DVRR	Yes	No
OEM 9776 B2 Models (1270 MB)					
BZ7B1-A	60	No	Not	No	Not
BZ7B1-B	50	No	Appli-	No	Appli-
BZ7B1-C	60	Yes	cable	No	cable
BZ7B1-D	50	Yes		No	

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ7B1-E	60	No	Not Applicable	Yes	Not Applicable
BZ7B1-F	50	No		Yes	
BZ7B1-G	60	Yes		Yes	
BZ7B1-H	50	Yes		Yes	
BZ7B2-E	60	No		No	
BZ7B2-G	60	Yes		No	
BZ7B3-A	60	No		No	
BZ7B3-B	50	No		No	
BZ7B3-C	60	Yes		No	
BZ7B3-D	50	Yes		No	
BZ7B3-E	60	No		Yes	
BZ7B3-F	50	No		Yes	
BZ7B3-G	60	Yes		Yes	
BZ7B3-H	50	Yes		Yes	
OEM 9776 C2 Models (1270 MB)					
BZ8A1-A	60	No	Neither	No	No
BZ8A1-B	50	No	Neither	No	No
BZ8A1-C	60	Yes	Neither	No	No
BZ8A1-D	50	Yes	Neither	No	No
BZ8A1-E	60	No	SS	No	No
BZ8A1-F	50	No	SS	No	No
BZ8A1-G	60	Yes	SS	No	No
BZ8A1-H	50	Yes	SS	No	No

Table Continued on Next Page

TABLE 4-4. CDC DAF CAPABLE FMD UNITS (Contd)

Equipment Number	Frequency (Hz)	Fixed Heads	Interface Switch	DAF Installed	16/8 Device Capability
BZ8A1-J	60	No	Neither	Yes	No
BZ8A1-K	50	No	Neither	Yes	No
BK8A1-L	60	Yes	Neither	Yes	No
BZ8A1-M	50	Yes	Neither	Yes	No
BZ8A1-N	60	No	SS	Yes	No
BZ8A1-P	50	No	SS	Yes	No
BZ8A1-R	60	Yes	SS	Yes	No
BZ8A1-S	50	Yes	SS	Yes	No
BZ8B1-A	60	No	Neither	No	Yes
BZ8B1-B	50	No	Neither	No	Yes
BZ8B1-C	60	Yes	Neither	No	Yes
BZ8B1-D	50	Yes	Neither	No	Yes
BZ8B1-E	60	No	SS	No	Yes
BZ8B1-F	50	No	SS	No	Yes
BZ8B1-G	60	Yes	SS	No	Yes
BZ8B1-H	50	Yes	SS	No	Yes
BZ8B1-J	60	No	Neither	Yes	Yes
BZ8B1-K	50	No	Neither	Yes	Yes
BZ8B1-L	60	Yes	Neither	Yes	Yes
BZ8B1-M	50	Yes	Neither	Yes	Yes
BZ8B1-N	60	No	SS	Yes	Yes
BZ8B1-P	50	No	SS	Yes	Yes
BZ8B1-R	60	Yes	SS	Yes	Yes
BZ8B1-S	50	Yes	SS	Yes	Yes

TABLE 4-5. CDC DISK STORAGE UNITS

Product Number	Equipment Number	Frequency (Hz)	Number of Devices	Capacity
CDC STANDARD UNITS				
33800-B2	BZ640-A	60	2	1260 MB
33800-B2	BZ640-B	50	2	1260 MB
33800-B4	BZ640-C	60	4	2520 MB
33800-B4	BZ640-D	50	4	2520 MB
OEM UNITS				
97380-13G	BZ8G1-A	60	2	1260 MB
97380-13G	BZ8G1-B	50	2	1260 MB
97380-26G	BZ8G1-C	60	4	2510 MB
97380-26G	BZ8G1-D	50	4	2520 MB
97380-13G	BZ8H1-A	60	2	1260 MB
97380-13G	BZ8H1-B	50	2	1260 MB
97380-26G	BZ8H1-C	60	4	2510 MB
97380-26G	BZ8H1-D	50	4	2520 MB

TABLE 4-6. CONTROLLER/DRIVE INSTALLATION CHECK LIST

PRE-INSTALLATION	
( )	Check to ensure that all applicable hot line TWXs, service bulletins, unverified service bulletins, and deviations are on site.
( )	Check to ensure that all applicable manuals (at correct revision level) are on site.
( )	Check to ensure that customer-provided power receptacle/connector has the proper current rating and is located no more than 3.7 metres (12 feet) from the storage control.
( )	Check to ensure that customer source voltage is in accordance with equipment specifications.
( )	Check planned floor layout and floor cutouts for compliance with site planning kit.
( )	Check air conditioning ducts to ensure adequate equipment cooling.
( )	Check to ensure that special tools, test equipment, spares, etc. are on site.
EQUIPMENT SETUP	
( )	Uncrate controller/drive and check for damage in transit. Refer damage complaints to carrier.
( )	Remove and inventory all controller/drive accessories and loose parts.

Table Continued on Next Page

TABLE 4-6. CONTROLLER/DRIVE INSTALLATION CHECK LIST (Contd)

( )	Remove floor tiles as necessary and place all interface cables into position underneath false floor. Label all bus and tag cables. Replace tiles.
( )	Move controller/drive into position and place power cord underneath false floor. Plug in power cord (main ac circuit breaker should be off).
	MECHANICAL INSPECTION
( )	Visually inspect back panel. Check for bent pins, recessed pins, broken wires, etc.
( )	Visually inspect card rack. Check for missing, loose, or improperly positioned cards.
	ELECTRICAL INSPECTION
( )	Set power supply voltage taps to proper source voltage. Controller/drives are normally set at factory to accept 208 V, 60 Hz or 380 V, 50 Hz.
( )	Check all power supply connections, fuse holders, filters, circuit breakers, etc.
	JUMPER/SWITCH SELECTIONS
( )	Set up switch/jumper selections.

Table Continued on Next Page

TABLE 4-6. CONTROLLER/DRIVE INSTALLATION CHECK LIST (Contd)

POWER ON CHECKS	
( )	Install all interface cables. Install all required terminators and EPO plugs.
( )	Set controller/drive circuit breakers to their ON position.
( )	Check power supplies for proper voltage levels.
( )	Check operation of maintenance and operator panels.
DIAGNOSTIC CHECKS	
( )	Load inline microdiagnostic disk in storage control.
( )	Execute inline tests. Refer to troubleshooting manual for operating procedure.

SECTION 4A

CAU/HPD INSTALLATION

SECTION 4E

HSC/DSU INSTALLATION

INTRODUCTION

This subsection contains information relating to the installation and checkout of the Head of String Controller (HSC) and Disk Storage Unit (DSU). The information in this subsection relates to site requirements, equipment setup, power, cabling, unpacking, address selections, and final checks.

TERMINOLOGY

The following discussion defines terminology used in this section.

DSU — Refers to a cabinet that contains four devices (or spindles) and associated power circuits.

HSC — Refers to a cabinet that contains one or two controllers plus power supplies, cabling, etc.

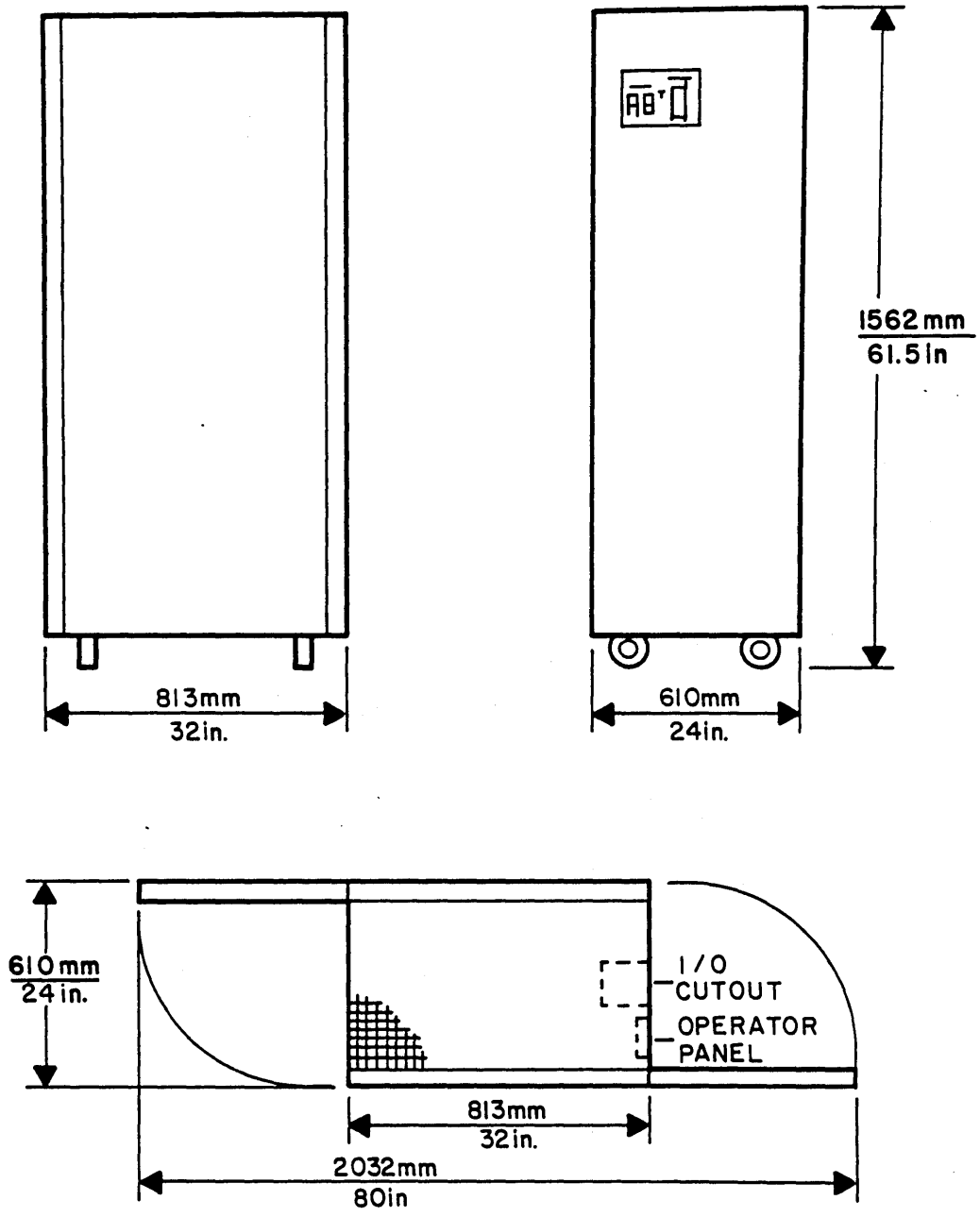
SITE REQUIREMENTS

ENVIRONMENTAL SPECIFICATIONS

The site must provide a suitable environment for both pieces of equipment, as defined in the applicable Hardware Reference Manual.

PHYSICAL SPECIFICATIONS

Figure 4E-1 illustrates the floor space requirements for the HSC and the DSU. A minimum clearance of 760 millimetres (30 inches) must be provided at the front and rear of both equipment types. The HSC requires at least 610 millimetres (24 inches) of side clearance. All DSU and HSCs are bolted together in a string and the HSC may be bolted at either end of the string of DSUs.



HSC

12F9-1A

Figure 4E-1. Space Requirements (Sheet 1 of 2)

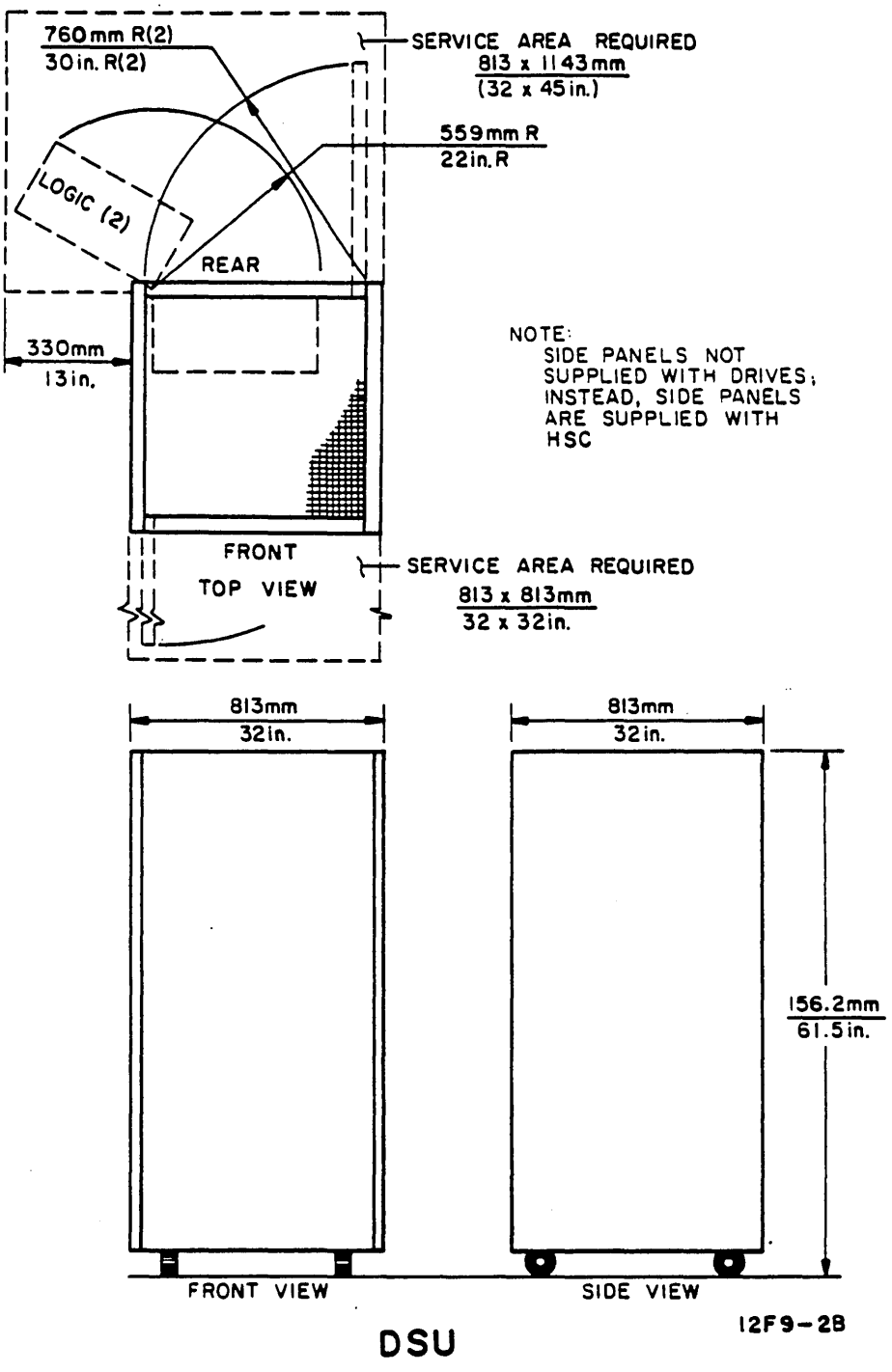


Figure 4E-1. Space Requirements (Sheet 2)

ELECTRICAL SPECIFICATIONS

Power for all DSUs in a string is routed through the HSC, which receives its power directly from the site power source or site distribution panel. The current-carrying capacity of the site power bus must be 60 A, maximum, for a 208-volt 60-Hz source. Power bus ratings for other voltages must agree with the applicable electrical code.

All HSCs and DSUs are shipped prewired for either 208 V ac, 60 Hz, 3-phase delta or 380 V ac, 50 Hz, 3-phase wye.

HSCs designed for 60-Hz operation will operate satisfactorily over a frequency range from 59.0 to 60.6 Hz, and at a voltage range of 180 to 253 V ac, 3-phase delta wiring.

HSCs and DSUs designed for 50 Hz operation will operate satisfactorily over a frequency range of 49.0 to 50.5 Hz and within either of the following voltage ranges:

170 to 242 V ac, 3-phase, delta-wired

323 to 449 V ac, 3-phase, wye-wired

Table 4E-1 contains the power consumption information for the DSU and HSC.

TABLE 4E-1. POWER CONSUMPTION

Unit Type	Apparent Power	Power Factor	Power Consumption
HSC	0.85 kVA	0.88	750 W*
DSU	2.2 kVA	0.82	1800 W*

* For 50 Hz units only, a label on the first unit (an HSC) plus a string of four drives carries the maximum ratings for the complete string as follows: 3 phase, 36 ampere/phase, 3 or 4 wire (as applicable), 8750 watts

SPECIAL TOOLS AND TEST EQUIPMENT

Table 4E-2 lists tools and test equipment used at installation and for maintenance procedures.

TABLE 4E-2. SPECIAL TOOLS AND TEST EQUIPMENT

Description	Part Number
_SQX Component Assembly (MTD Adapter Card)	54364900
Brake Pulley Gauge	8513690X
Card Extender (HSC)	83633015
Card Extender (1/2) (DSU)	82318800
Card Extender (Full) (DSU)	82318700
Conductive Static Shielding Bags:	
(5 x 8)	12263624
(8 x 12)	12263625
(10 x 12)	12263626
(14 x 18)	12263499
(16 x 24)	12263627
DDC Terminator	75268902
Hex driver (6mm)	94391311
Maintenance Panel Round Cable	73164620
Spring Compression Tool	85148000
Wrist Straps:	
Small	12263623
Large	12263496
Wrist Strap Tester	75446450

EQUIPMENT SETUP

The following paragraphs describe how to set up and connect each of the DSUs to an HSC in the subsystem. In general, it is wise to complete the setup procedures in the order listed in table 4E-3. Table 4E-4 lists the installation accessories.

NOTE

It is less confusing if cabling, labeling, and HDA installation are performed on a device-by-device basis rather than attempting to mark all cables, route them, and then install all HDAs. The overall sequence in table 4E-3 should be followed, as it applies to both techniques.

TABLE 4E-3. EQUIPMENT SETUP PROCEDURES

Procedure	Unit Affected	
	DSU	HSC
Uncrating	X	X
Inventory	X	X
Preinstallation Inspection	X	X
Power and Power Cabling	X	X
Interface Cabling	X	X
Final Unpacking	X	X
Address and Jumper Selections	X	X
Final Visual Checks	X	X
Final Checkout	X	X

UNCRATING

CAUTION

Do not remove any internal packing material until instructed to do so.

Uncrating instructions are packed on the outside of the shipping crate. Refer to those instructions for proper handling of the unit.

TABLE 4E-4. ACCESSORIES

Description	Part Number	Quantity
Leveler	94402800	4
Leveler Extension	73068802	4
Frame Bolt-together *		
Screws, 5/16-18 x 1	92855196	4
Washers, Flat, 5/16	10125609	8
Washers, Spring Lock, 5/16	10125807	4
Nut, Hex, 5/16-18	10125302	4
*Provided with DSU		
Side Panels (provided with HSC)	Refer to FV716 Maintenance Manual (Parts Data)	2

INVENTORY

When uncrating is complete, check off all parts listed on the shipping bill against the actual items received. Report all discrepancies, missing items, damaged items, etc. to the Account Sales Representative responsible for the equipment.

PREINSTALLATION INSPECTION

Perform the following steps prior to installation.

1. Inspect all DSUs and HSCs for possible shipping damage. Promptly file any claims for this type of damage with the carrier involved. If you file a claim, save the original shipping materials.

2. Verify that all internal cabling appears to be intact and that there are no broken or damaged wires.

3. Check the backpanels of all units for broken or shorted pins or wires.

FINAL UNPACKING

LEVELING AND PLACEMENT

Remove side panel from the HSC that is closest to the DSU by performing the following steps:

1. Open front and rear doors.

2. Unlock side panels (on HSC) by inserting a 6-mm hex wrench into the fastener located inside frame rail (figure 4E-2) and turning the wrench counterclockwise 1/4 turn.

3. Remove and retain the quarter turn fasteners and retaining ring that secure the side panel to the frame.

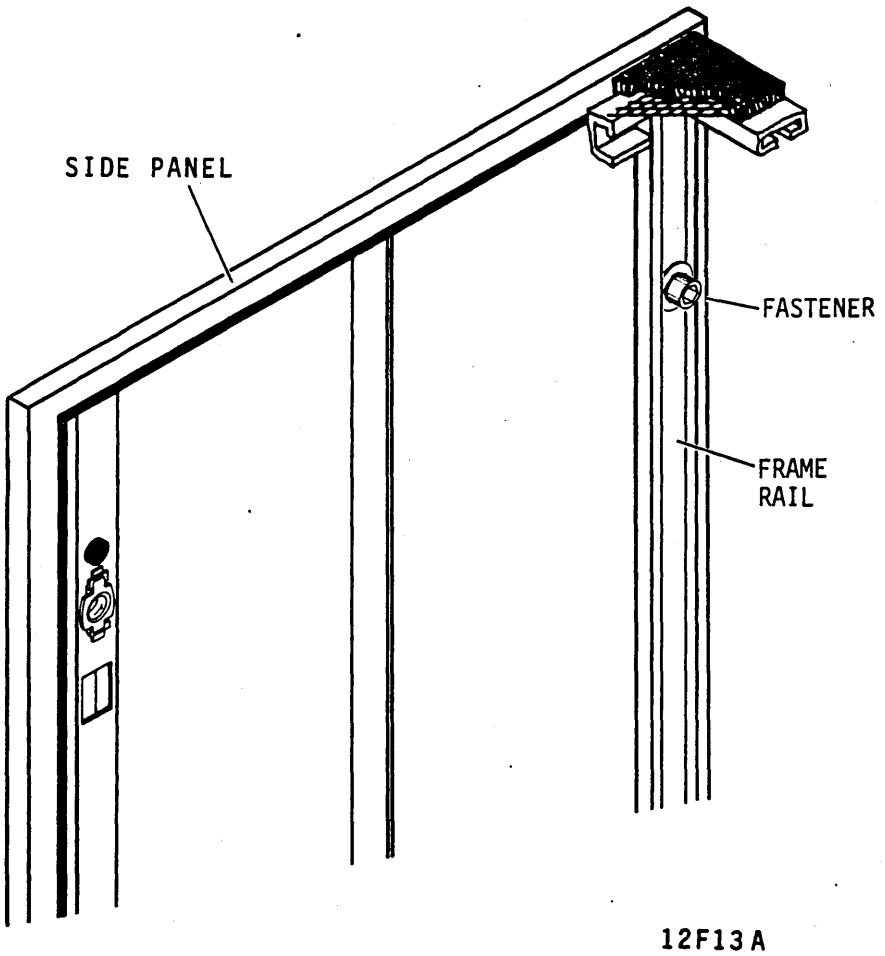


Figure 4E-2. Side Panel Removal

3. Disconnect ground straps and lift side panel out of unit. Retain longer ground strap for future use.

Roll unit into its final floor position as assigned in the site planning kit. Level unit by performing the following steps:

1. Open front and rear doors.

2. Insert extension and screw it into frame from below far enough so that pad can be pressed into place as shown in figure 4E-3. Press pad in place. Turn leveler until pad touches the floor.

3. Repeat step 2 for all levelers.

4. Use 5/8 inch wrench on the hex surface (just above the pad) of each leveler to lower levelers until casters are off the floor.

5. Place spirit level on base of frame so ends of level point to front and rear of unit.

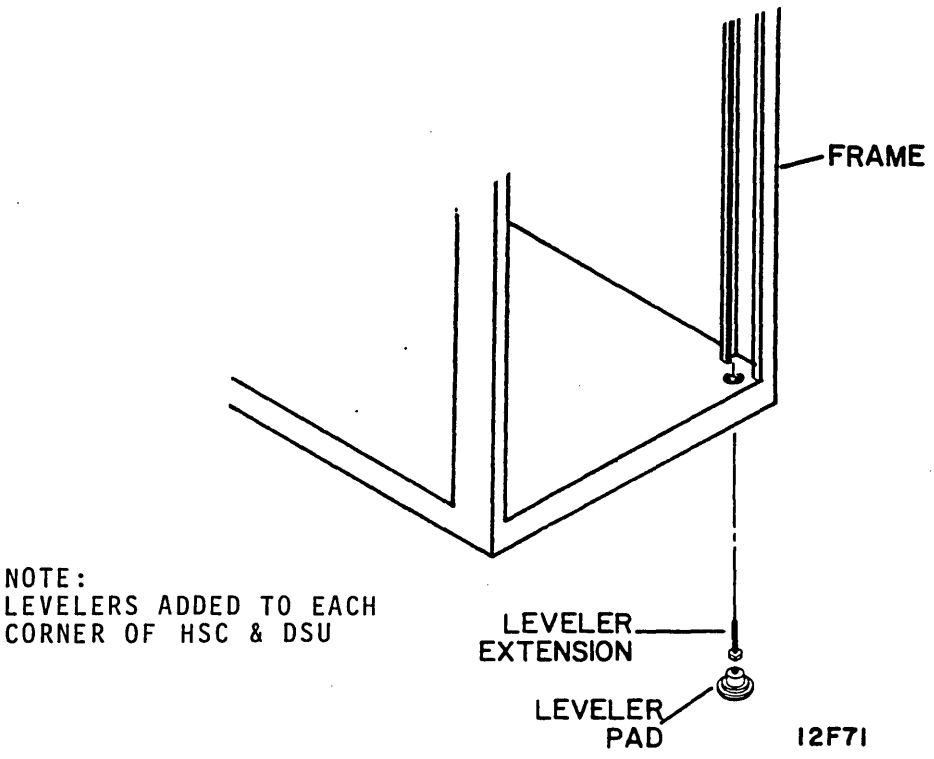


Figure 4E-3. Leveling Pad Installation

6. Adjust levelers until bubble is centered on spirit level.

7. Place spirit level on base of frame so ends of level point to sides of unit.

8. Adjust levelers until bubble is centered on spirit level.

9. Repeat steps 4 through 8 until cabinet is level.

10. Repeat steps 1 through 9 for each cabinet in the string. Maintain a uniform height for all cabinets.

NOTE

On HSC remove 1/4 turn fastener before attempting to bolt units together.

11. Secure the frames together at top and bottom of frame with hardware shown in figure 4E-4.

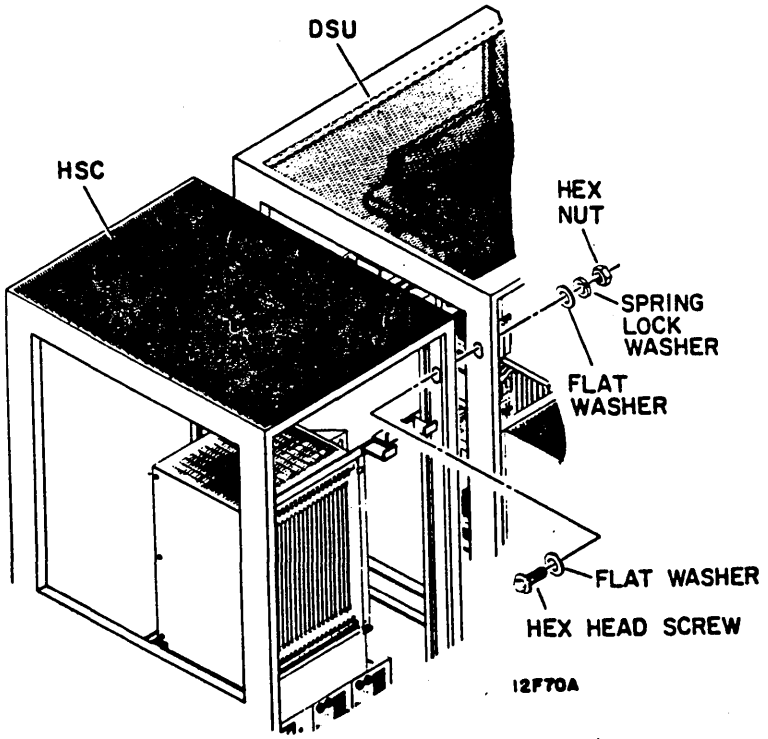


Figure 4E-4. Bolting Frames Together

12. Attach side panel removed from HSC. Add longer ground strap (removed earlier) between frame and side panel.

NOTE

Install new retaining rings if rings are damaged during removal. Failing to install a retaining ring or installing a damaged ring may cause fastener to loosen and fall into the DSU.

13. Install quarter turn fasteners and retaining rings on the side of the DSU frame on which the side panel is installed.

AIR MOVER SHIPPING RESTRAINTS

Four restraining brackets, one attached to each air mover shock mount, prevent movement of the air mover during shipment. The brackets are illustrated in figure 4E-5 and are released as follows:

1. Loosen the two nuts that secure each of the four restraining brackets to the air mover panel.

2. Swing the slotted end of the bracket outward 180 degrees.

3. Tighten both nuts to secure each of the brackets in the stowed position and prevent the hardware from being lost.

DSU LOGIC CHASSIS RETAINER REMOVAL

Cut straps and remove 2 x 4 boards holding logic chassis in place during shipment. Retain boards in case unit must be returned to manufacturer.

HDA UNPACKING

You will need a copy of the Disk Storage Unit Maintenance Manual (Publication Number 83337450) before performing this procedure.

HDAs are packaged separately from the DSU when it is shipped from the factory. The packaged HDA is strapped to a pallet for handling convenience and protection during shipment. Each HDA is identified by a label, indicating the unit (DSU) serial number, model number (BZXXX), and the device (HDA) number (0, 1,

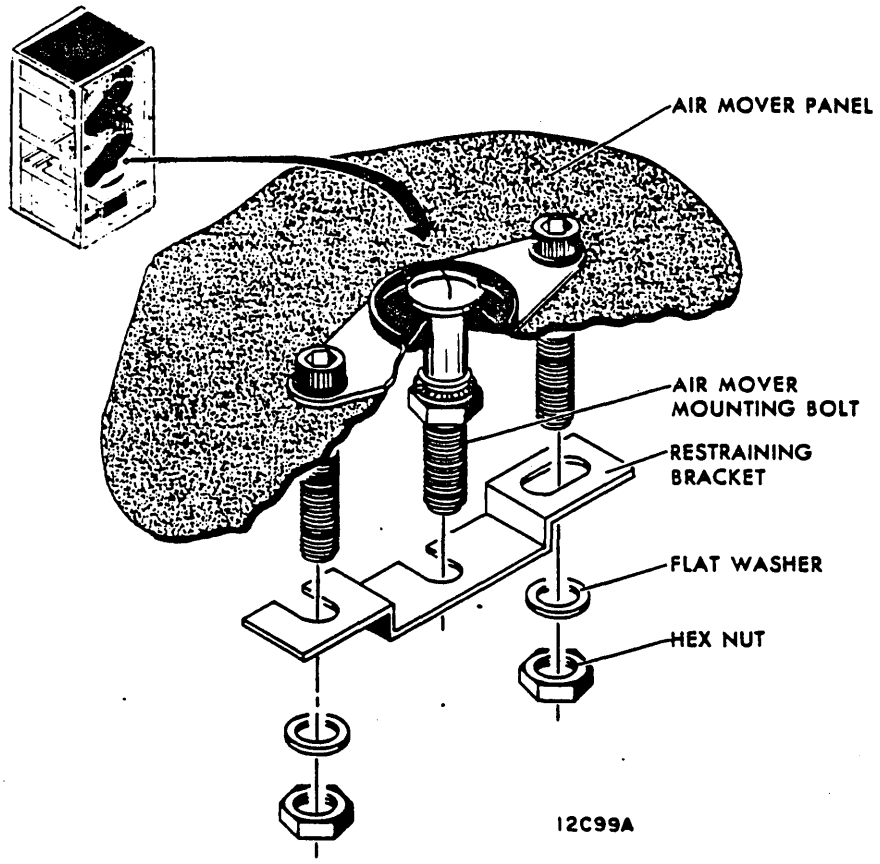


Figure 4E-5. Air Mover Shipping Restraint Removal

2, or 3). This label allows installation of the HDA in the same position in the DSU in which the unit was tested at the factory.

WARNING

Two persons are required to lift an HDA since it weighs approximately 36.3 kg (80 pounds).

An HDA contains static-sensitive components and is subject to damage if improperly handled. Review the Safety Precautions, Handling Electrostatically Sensitive Assemblies, and HDA Handling procedures in section 1A of the Disk Storage Unit Maintenance Manual (Publication Number 83337450) before attempting to unpack and install an HDA.

1. Transport packaged HDAs to an area where they can be unpacked with minimal danger of damage from shock, heat, cold, vibration, and/or contamination.

2. Remove the box cover and allow the bagged HDA to stabilize to the ambient temperature of the installation/operational environment. Allow four hours minimum stabilization time if the "transit/storage" to "installation/operational" temperature differential is 16.7 degrees C (30 degrees F) or less. Allow at least eight hours stabilization time if the temperature differential is over 16.7 degrees C (30 degrees F), or cannot be reasonably determined.

CAUTION

Continue to unpack the HDA only after the required temperature stabilization period.

3. Unpack the HDA using the unpacking instructions supplied with it.

4. Ensure the DSU is installed in its final operating location, is leveled, and all applicable unpacking procedures have been completed. This eliminates the need to move the unit after HDA installation.

5. Loosen the nut on each of the HDA shock mounts in the DSU. Position each nut so it is flush with the end of the bolt.

6. Install each HDA into the proper position using steps 7 through 12 of the HDA Replacement procedure in section 1C of the Disk Storage Maintenance Manual (83337450). HDA location information (device number) is provided on the HDA label. An assembly locator diagram is provided on the logic rack card cover. Assembly designators and device (HDA) numbers are listed in table 4E-5. HDA drive belts, belt tension springs, and belt guards were packed and taped inside the DSU for shipment.

TABLE 4E-5. ASSEMBLY-DEVICE NUMBER CORRELATION

Assembly Designator	Device Number
A7A0	0
A7A1	1
A7A2	2
A7A3	3

7. Electrical connections to the HDA were made if step 6 was correctly performed. They are in table 4E-6 for checking purposes.

TABLE 4E-6. HDA CABLE CONNECTIONS

HDA Connector	Mating Connector	Description
A7AXJ9	A7AXP9	Index/Speed Transducer
A7AXJ1	A7AXP1	HDMA Cable to Head Select Card
A7AXJ2	A7AXP2	HDA Flat Cable to Select Card
A7AXJ6	A7AXP6	Servo (voice coil) Cable Beneath Magnet Housing
A7AXJ10	A7AXP10	Carriage Interlock Switch
A7AXE1 *	Ground Cable Faston	HDA Static Ground Wire
* Faston tab located at top/front of the HDA		

HDA DRIVE BELT AND BELT GUARD INSTALLATION

After HDAs are in the installed position and leveled, install the HDA belts and belt guards as shown in figure 4E-6.

WARNING

Obtain spring compression tool P/N 85148000 to compress the belt tension spring before starting this procedure. Use of any other tool may cause the spring to slip out with enough force to cause personal injury and/or damage to the the equipment.

1. Open front and rear doors to gain access to HDA belts and belt guards stored on the PCU top cover during shipment.

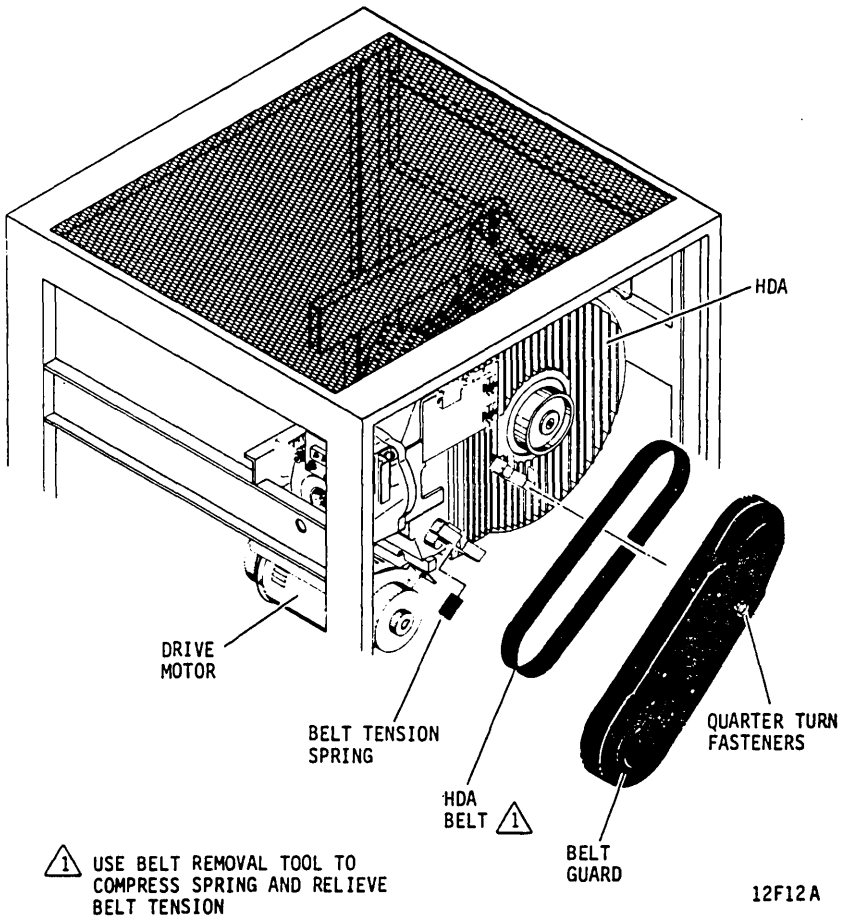


Figure 4E-6. Drive Belt and Belt Guard Installation

2. Remove steel band that secures HDA and drive motor during shipment.

3. Install spring compression tool and compress the spring.

4. Install the drive belt on the motor and HDA pulleys, ensuring it is centered.

5. Slowly release the spring compression tool to tension the belt.

6. Unlock the spindle.

7. Install belt guard.

8. Repeat steps 3 through 7 until all belts and belt guards are installed.

POWER AND POWER CABLING

WARNING

Do not connect site power until instructed to do so.

All HSCs and DSUs are shipped prewired for either 208 V, 60 Hz or 380 V, 50 Hz. Every DSU is furnished with its own 3.6 metre (12 ft) input power cable and connector. Every 60 Hz HSC is supplied with its own 4.5 metre (15 ft) power cable and connector; however, each 50 Hz HSC is supplied with a 4.5 metre (15 ft) cable.

Figure 4E-7 illustrates power cord routing for the subsystem. Connect the power cord from each master or slave power supply in a DSU to the appropriate connector on the bottom of the power control unit in the HSC.

AC POWER

CAUTION

Heed the instructions in the following paragraphs regarding proper phasing of the ac power cable. Correct phase rotation is normally indicated by the PHASE GOOD indicator on the HSC's PCU being lighted.

Phase detection circuits within the HSC will normally prevent a successful power up sequence if phases of the ac input power are connected incorrectly.

Interchanging the phase A, B, or C conductor with the neutral conductor on 60 Hz units will not be detected by the phase rotation circuits. This type of wiring error prevents the drive motors from reaching full speed and consequently results in overheating.

The HSC 60 Hz power cord has a four-pin male connector (figure 4E-8) that is plugged into a mating female connector wired according to the phasing described in table 4E-7.

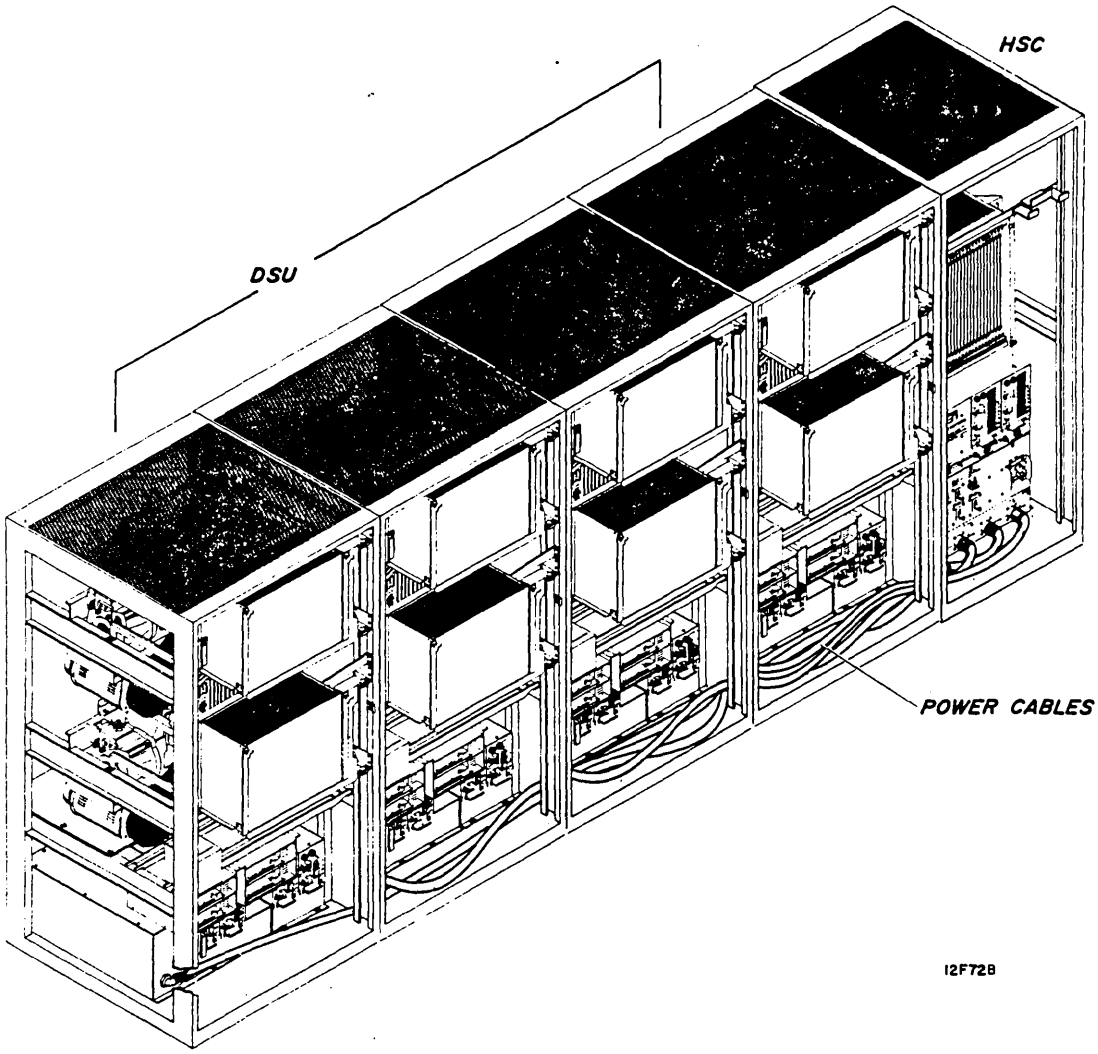


Figure 4E-7. Power Cord Routing

Since the power cord for a 50 Hz HSC has no connector (see figure 4E-9), refer to table 4E-8 for proper phasing connections. Note that the green wire is a safety ground and should not be used as a neutral line.

CAUTION

ON 50 HZ UNITS

It is possible that the PHASE GOOD indicator will still light if one or more of the phases are not connected at all.

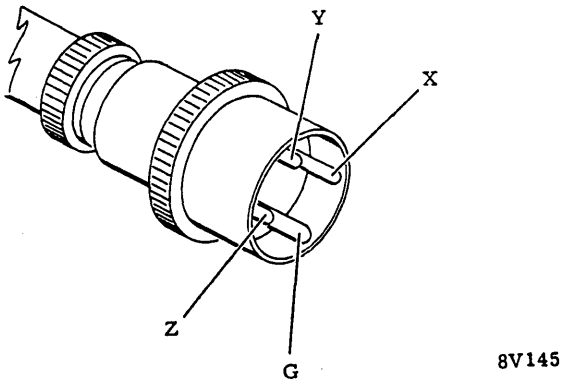


Figure 4E-8. 60 Hz Cable Connector

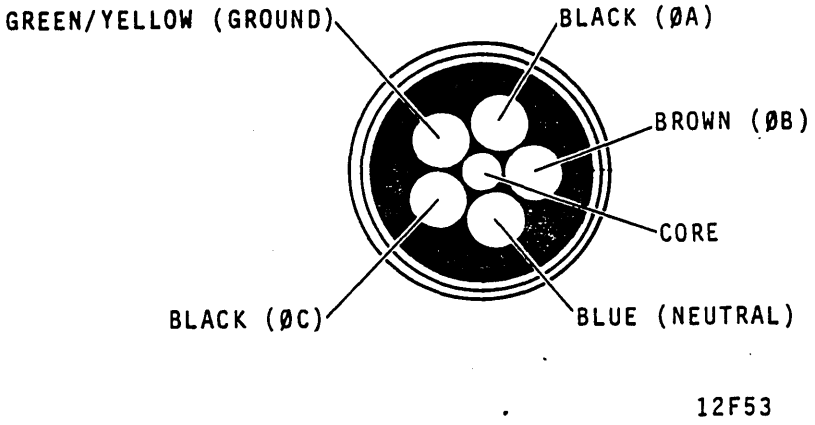


Figure 4E-9. 50 Hz Power Cord Connection

TABLE 4E-7. 60-Hz PHASE CONNECTIONS

Phase	Connector Pin	Wire Color	Line Filter Terminal
A		Black	A
B	Y	Red	B
C	Z	Brown	C
Gnd	G	Green Wire	Gnd Stud
-	G	(& Shield)	Cable Clamp

TABLE 4E-8. 50-Hz PHASE CONNECTIONS

Phase	Wire Color	Line Filter Terminal
A	Black	A
B	Brown	B
C	Black	C
Neutral	Blue	D
Gnd	Grn/Yel	Gnd Stud

OUTPUT POWER CABLES

The HSC has four 7-pin, output ac power connectors used for supplying ac power to the drives. Table 4E-9 shows how the phasing is distributed to the four DSUs.

TABLE 4E-9. AC POWER OUTPUT PHASING (60 Hz)

Pin No.	Drive 1 (Dev 0-3)	Drive 2 (Dev 4-7)	Drive 3 (Dev 8-B)	Drive 4 (Dev C-F)
1	Phase B	Phase A	Phase C*	Phase B#
2	Phase A	Phase C	Phase B**	Phase A##
3	NC	NC	NC	NC
4	Safety Gnd	Safety Gnd	Safety Gnd	Safety Gnd
5	Phase C	Phase B	Phase A***	Phase C###
6	NC	NC	NC	NC
7	Safety Gnd	Safety Gnd	Safety Gnd	Safety Gnd

NC = No Connection
* = Phase B for 50 Hz unit
** = Phase A for 50 Hz unit
*** = Phase C for 50 Hz unit
\# = Phase C for 50 Hz unit
= Phase B for 50 Hz unit
= Phase A for 50 Hz unit

HSC POWER CONTROL UNIT VOLTAGE SELECTION

PCU operating voltage selections, other than those wired into a unit at the time of shipment from the factory, may be changed.

In 60 Hz power control units proceed as follows:

1. Figure 4E-10 shows the locations of transformers A4T1 and A4T3 and other parts that must be removed to gain access to these transformers.

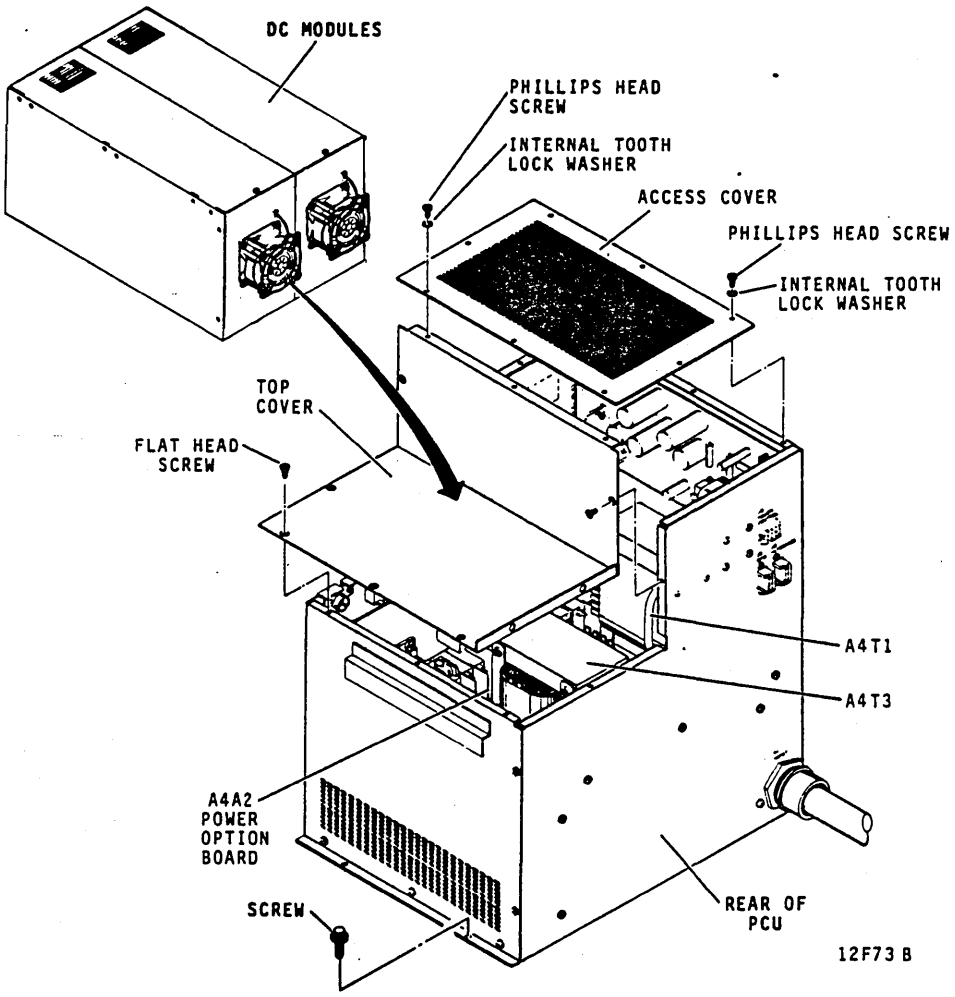


Figure 4E-10. Transformer Locator for Controller Voltage Selections

2. Normally, A4T1 is wired for 208 V ac, delta configuration. To select 230 V ac, move the brown wire pin 2 (A4T1) to pin 3 and also move the black wire pin 2 (A4T3) to pin 4 as shown in figures 4E-11 and 4E-12.

3. Replace all items that were removed to gain access to the transformers.

In 50 Hz power control units, proceed as follows:

1. Refer to figure 4E-10 for the locations of transformers A4T1 and A4T3.

2. Normally, A4T1 is wired for 380 V ac, wye configuration (primary wires of A4T1 terminate at connector P7, which is mated with J6 on power option board). To

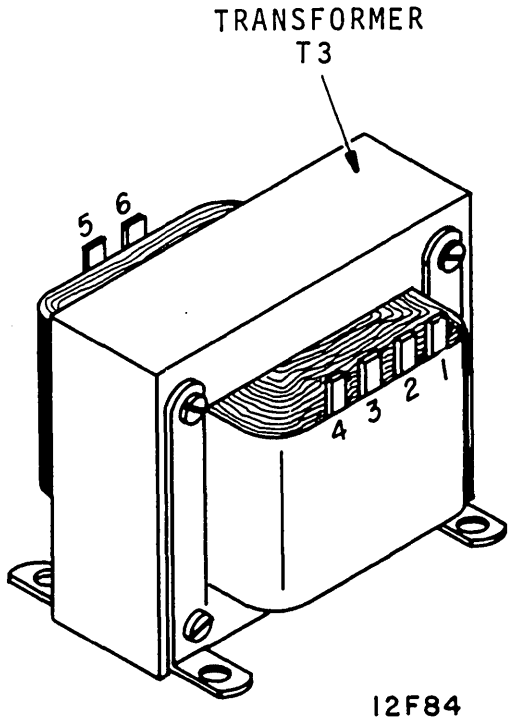


Figure 4E-11. Transformer T3 Pin Locations

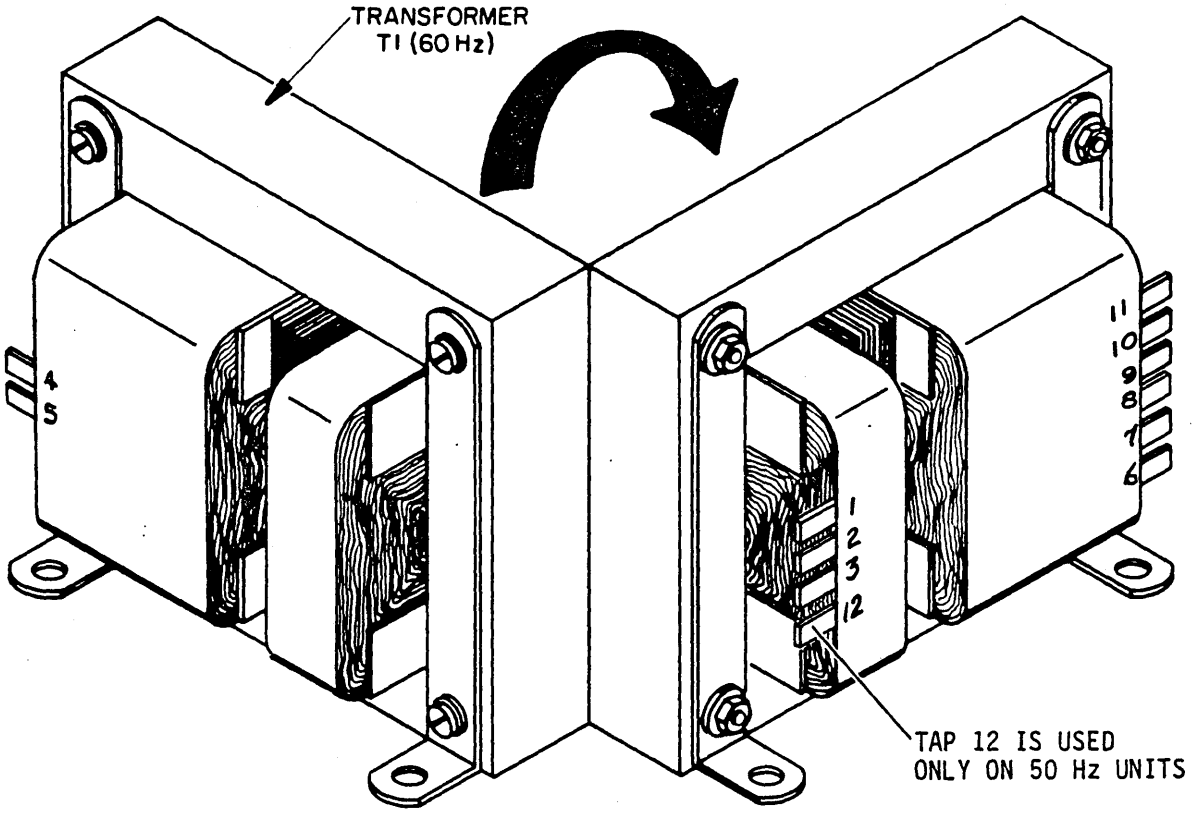


Figure 4E-12. Transformer T1 Pin Locations

locate P7, manually follow the two primary wires of A4T1 (brown and red) over to the power option board A4A2 (located on the outside of the PCU's filter box). To select a delta configuration, move P7 from J6 to J5. To select different voltage, move the taps of transformers A4T1 and A4T3 as shown in table 4E-10.

3. Replace all items that were removed to gain access to the transformers.

TABLE 4E-10. 50 Hz INPUT VOLTAGE SELECTION

Input Power Line Voltage	Connect P7 to A4A2Jx	Move A4T1 red wire to pin:	Move A4T3 black wire to pin:
200/208 V AC, delta	J5	2	2
220 V AC, delta	J5	3	3
230/235/240 V AC, delta	J5	12	4
380 V AC, wye	J6	3	3
398/400/408/415 V AC, wye	J6	12	4
NOTE: Some units do not contain transformer A4T3.			

DSU POWER CONTROL UNIT INPUT VOLTAGE SELECTION

AC input voltage selection may be changed from the voltages wired in the factory at installation. Voltage selection must agree with site power. Voltage selection is accomplished by selecting appropriate taps on the transformer primary windings. The motor power cable connection to the ac distribution board (_CMV) must be verified on 50 Hz units. Access to the transformers and _CMV board in the PCU is gained by removing the top cover.

Master Power Control Unit

The 60 Hz master PCU is factory wired for 200/208 V operation. Figure 4E-13 shows the locations of the transformers (T1 and T2) and the _CMV board. Table 4E-11 provides wiring information for transformers T1 and T2. Transformer taps are illustrated in figure 4E-14 (T1) and figure 4E-15 (T2).

The 50 Hz master PCU is factory wired for 380 V operation. Table 4E-12 provides wiring information for transformers T1 and T2, and indicates the proper motor power cable connection (J2 or J3) on the ac distribution board (_CMV). Figures 4E-14 and 4E-16 illustrate transformer taps and figure 4E-17 illustrates motor power connections.

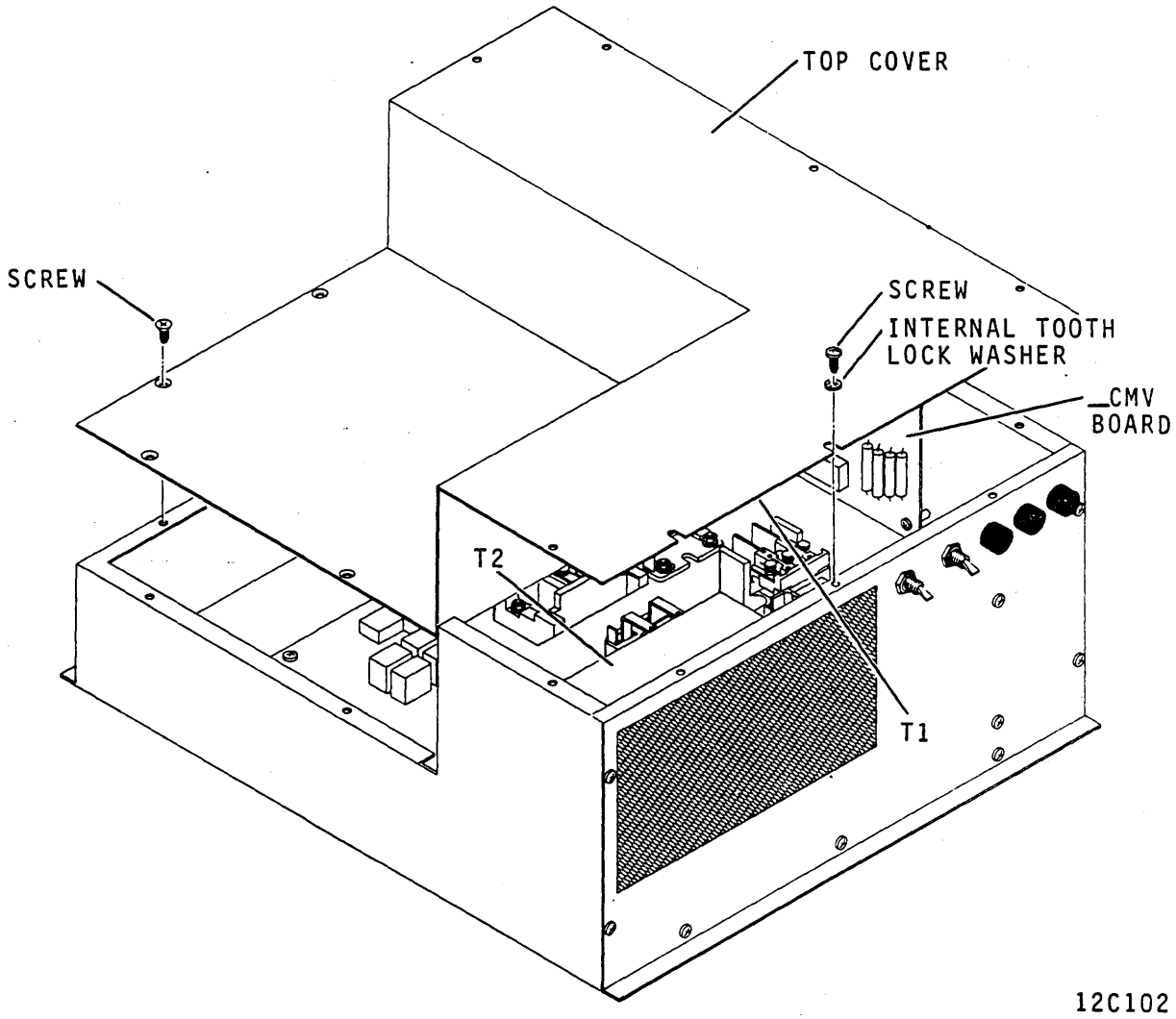
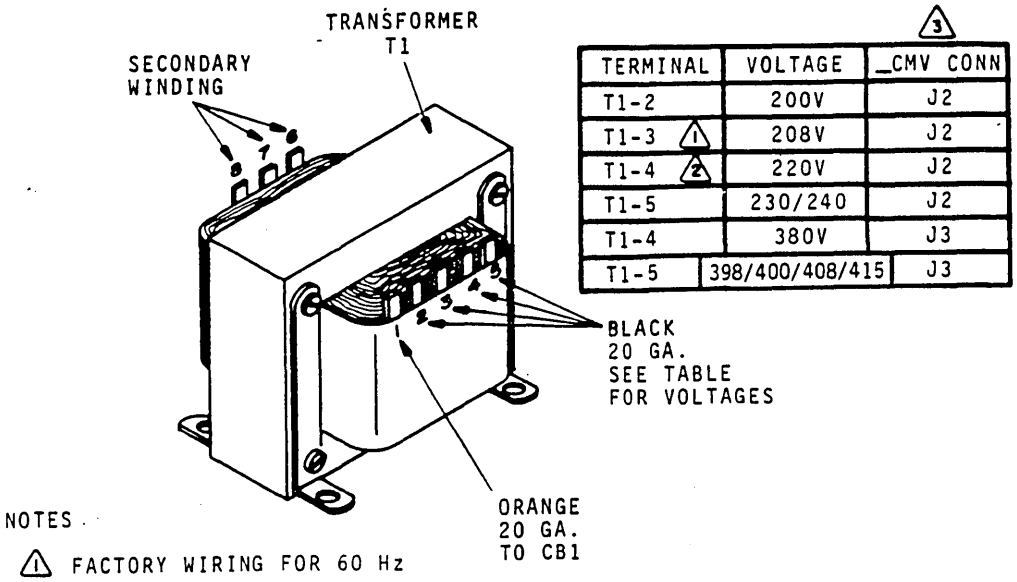


Figure 4E-13. Transformer Locator for DSU MPCU Voltage Selections

TABLE 4E-11. 60 Hz MPCU VOLTAGE SELECTION

Input Power Line Voltage	Black Wire to T1 Terminal	Red Wire to T2 Terminal
200	2	13
208*	3	13
230	5	14
* Factory Wired		



TERMINAL	VOLTAGE	_CMV CONN
T1-2	200V	J2
T1-3 (1)	208V	J2
T1-4 (2)	220V	J2
T1-5	230/240	J2
T1-4	380V	J3
T1-5	398/400/408/415	J3

NOTES

(1) FACTORY WIRING FOR 60 Hz

(2) FACTORY WIRING FOR 50 Hz

(3) DRIVE MOTOR AND BLOWER MOTOR HARNESS CONNECTS TO J2 OR J3 ON THE _CMV BOARD AS INDICATED IN THE TABLE.

12C93

Figure 4E-14. 60 Hz MPCU Voltage Selection (T1)

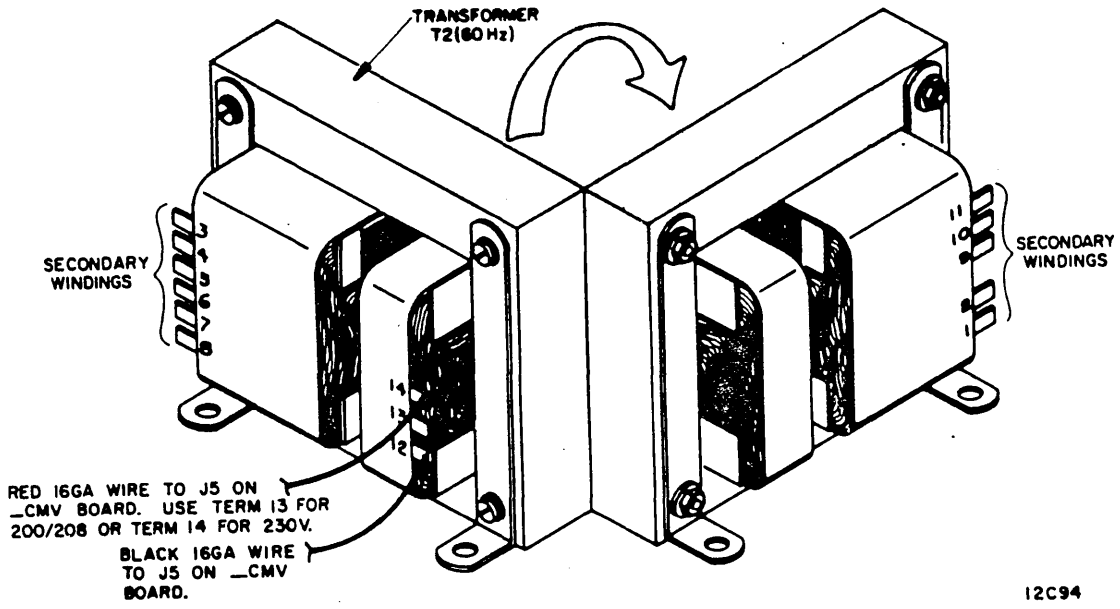


Figure 4E-15. 60 Hz MPCU Voltage Selection (T2)

TABLE 4E-12. 50 Hz MPCU VOLTAGE SELECTION

Input Power Line Voltage	_CMV Plug J2 or J3	Black Wire to T1 Terminal	Black Wire to T2 Terminal
200	J2	2	13
208	J2	3	13
220	J2	4	14
230/235/240	J2	5	15
380*	J3	4	14
398/400/408/415	J3	5	15

* Factory Wired

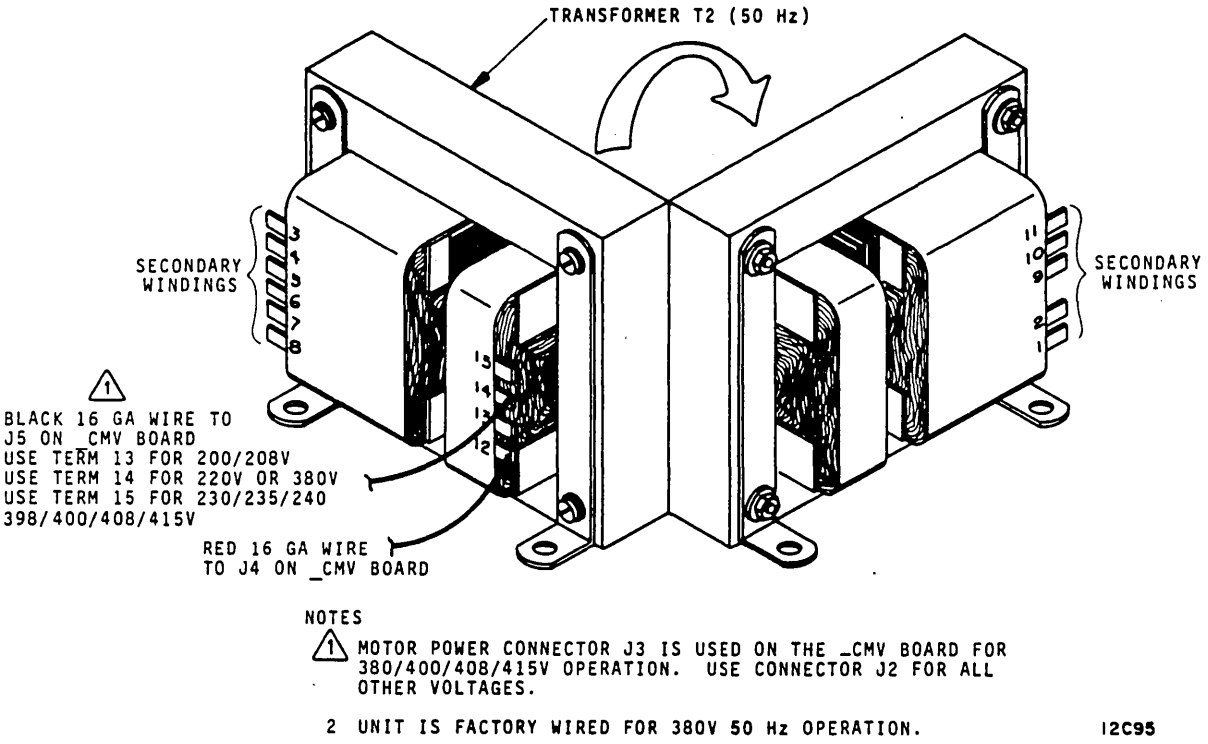
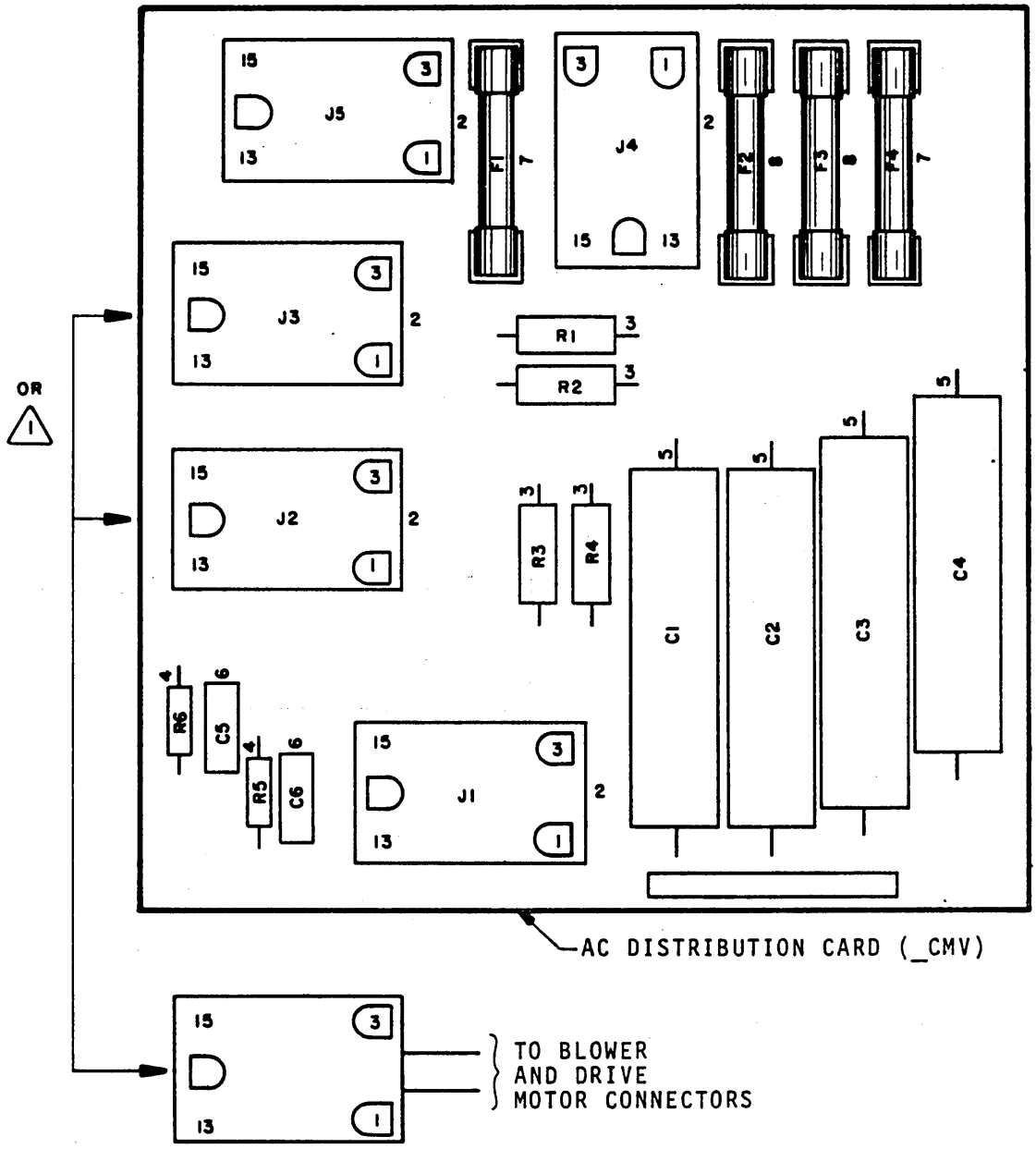


Figure 4E-16. 50 Hz MPCU Voltage Selection (T2)



NOTES

1. CONNECT TO J2 FOR 200, 208, 220, 230, 235, 240V 50Hz OPERATION
   CONNECT TO J3 FOR 380, 398, 400, 408, 415V 50Hz OPERATION

12C96A

Figure 4E-17. _CMV Board Connections (50 Hz)

Slave Power Control Unit

The 60 Hz slave PCU is factory wired for 208 V operation. Table 4E-13 provides wiring information for transformer T1. Figure 4E-18 shows the location of the tranformer in the slave PCU. Transformer taps are illustrated in figure 4E-19.

The 50 Hz slave PCU is factory wired for 380 V operation. Table 4E-14 provides wiring information for transformer T1 and indicates the proper motor power cable connection (J2 or J3) on the ac distribution board (_CMV). Figure 4E-20 illustrates transformer taps and motor power connections are shown in figure 4E-18.

TABLE 4E-13. 60 Hz SPCU VOLTAGE SELECTION (T1)

Input Voltage	Red Wire To T1 Terminal
200/208*	13
230	14
* Factory Wired	

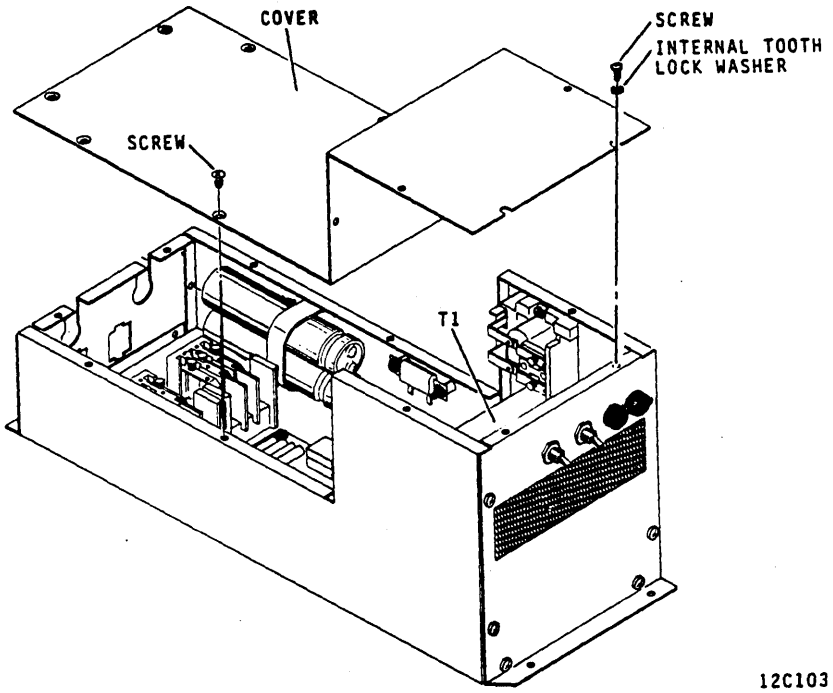


Figure 4E-18. Transformer Locator for DSU SPCU Voltage Selection

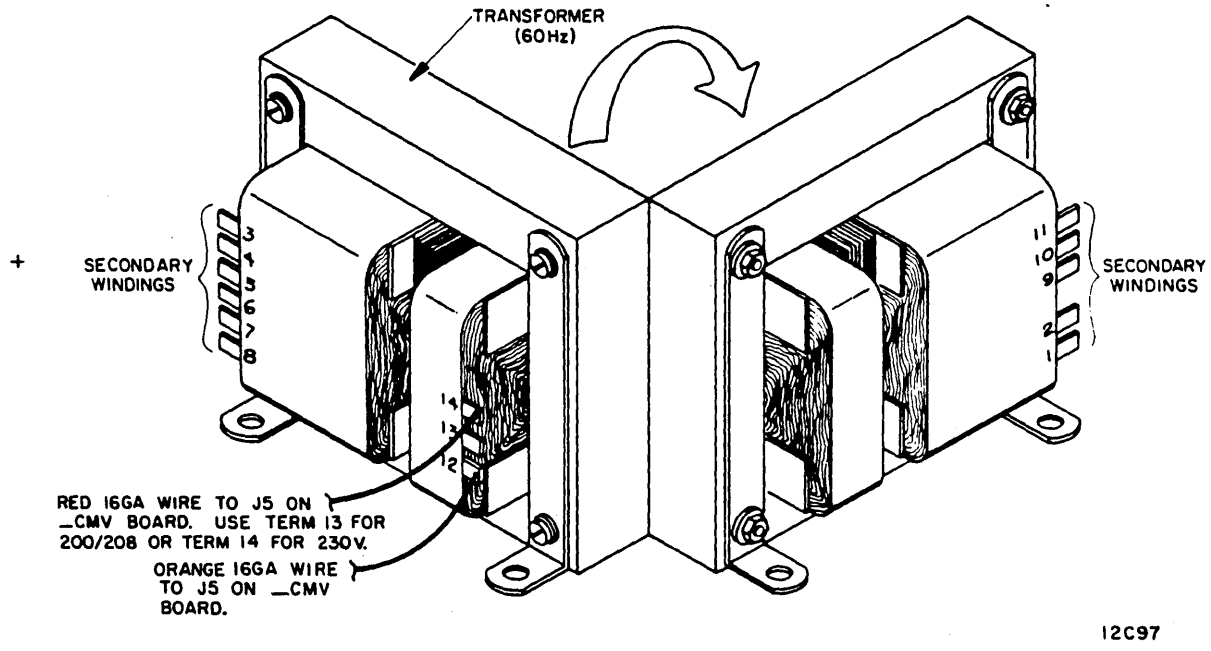


Figure 4E-19. 60 Hz SPCU (T1)

TABLE 4E-14. 50 Hz SPCU VOLTAGE SELECTION

Input Power Line Voltage	_CMV Plug J2 or J3	Red Wire to T1 Terminal
200/208	J2	13
220	J2	14
230/235/240	J2	15
380*	J3	14
398/400/408/415	J3	15

* Factory Wired

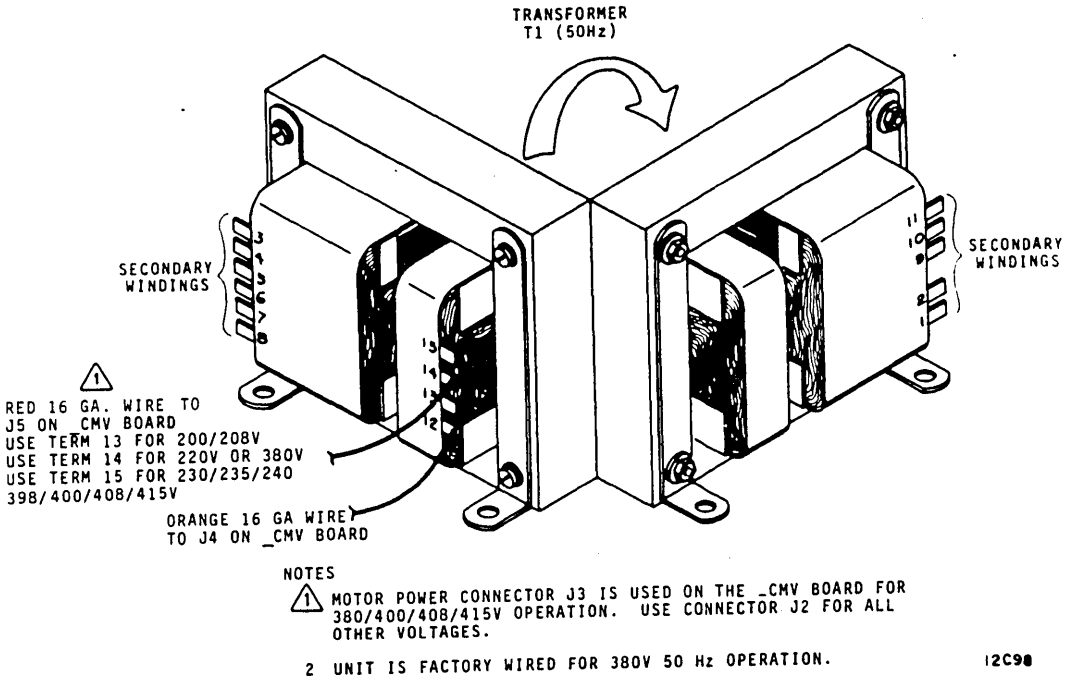


Figure 4E-20. 50 Hz SPCU Voltage Selection (T1)

GROUNDING

The importance of proper grounding procedures cannot be over emphasized. To be properly grounded, all units in a system must have two ground connections: (1) site ac power system safety ground and (2) a system ground. Both of these subjects are explained in the following paragraphs.

SITE POWER SYSTEM

The safety ground is provided by the green (or green with yellow stripes) wire in the ac power cord. This wire connects both to the drive's frame and controller's frame. It is routed through the ac power cord to earth ground via the ac branch circuit supplying power to the system.

SYSTEM GROUND

The system is grounded when the DSUs and HSC are bolted together. Grounding for the DDC interface is described in the DDC Interface procedure in this section.

INTERFACE CABLING

There are different types of interface cabling between the SCU and HSC and between the HSC and drives. The following paragraphs discuss installation of all of these types of cabling.

HSC BACKPANEL CONFIGURATIONS

The HSC may have either of two backpanels. Early units contain the ADPV backpanel. Later units (Series Code 09 and above, or earlier units with ECO 16368 installed) have the CDPV backpanel. Board locations between these two backpanels differ; these locations are shown in table 4E-15.

TABLE 4E-15. HSC BACKPANEL BOARD LOCATION CROSS REFERENCE

Board Type	ADPV B/P Slots		CDPV B/P Slots	
	CTLR 1	CTLR 2	CTLR 1	CTLR 2
_SQX	02	15	06	09
_SMX	03	14	16	17
_SLX	04	13	02	13
_SKX	05	12	03	12
_SJX	06	11	04	11
_SNX	07	10	05	10
_SPX	08	09	07	08

CDP INTERFACE

NOTE

The following cable installation procedure will be easier if two people are available to help perform the procedure.

The HSC provides connectors for up to 16 low-speed Controller to Device Port (CDP) cables and four high-speed read/write data cables (one to each device - see figure 4E-21). CDP cables are provided for the first two DSUs in a string; additional cables for additional DSUs must be ordered separately.

CAUTION

Carefully route all CDP cables from cabinet to cabinet since connectors can be broken or damaged in the installation process.

With front and rear cabinet doors open and the logic chassis open, begin with the first DSU in the string and route the low speed cables (flat) through the cable trellis along the top of the cabinet as shown in figure 4E-22. Secure the cables to

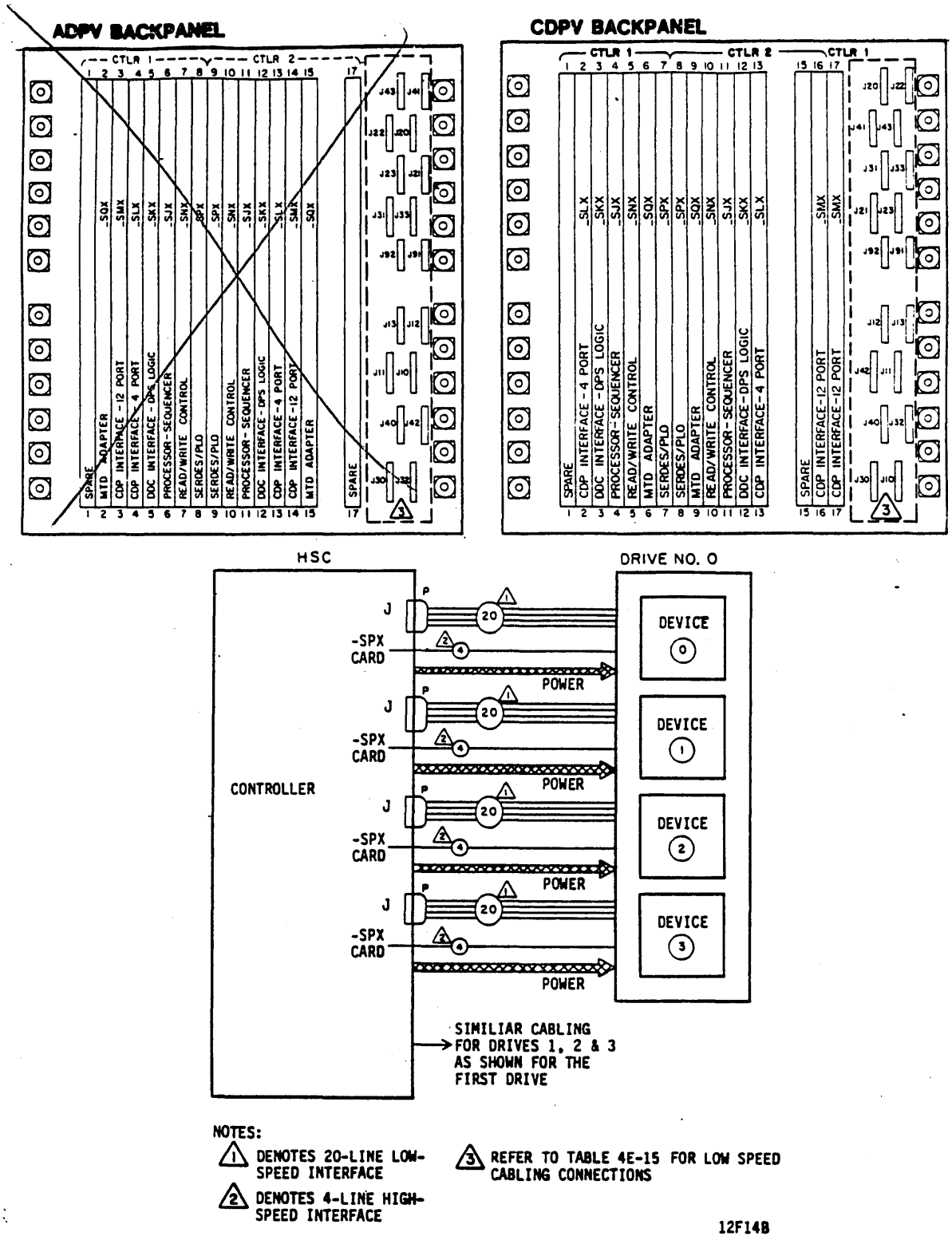


Figure 4E-21. HSC/DSU Cabling

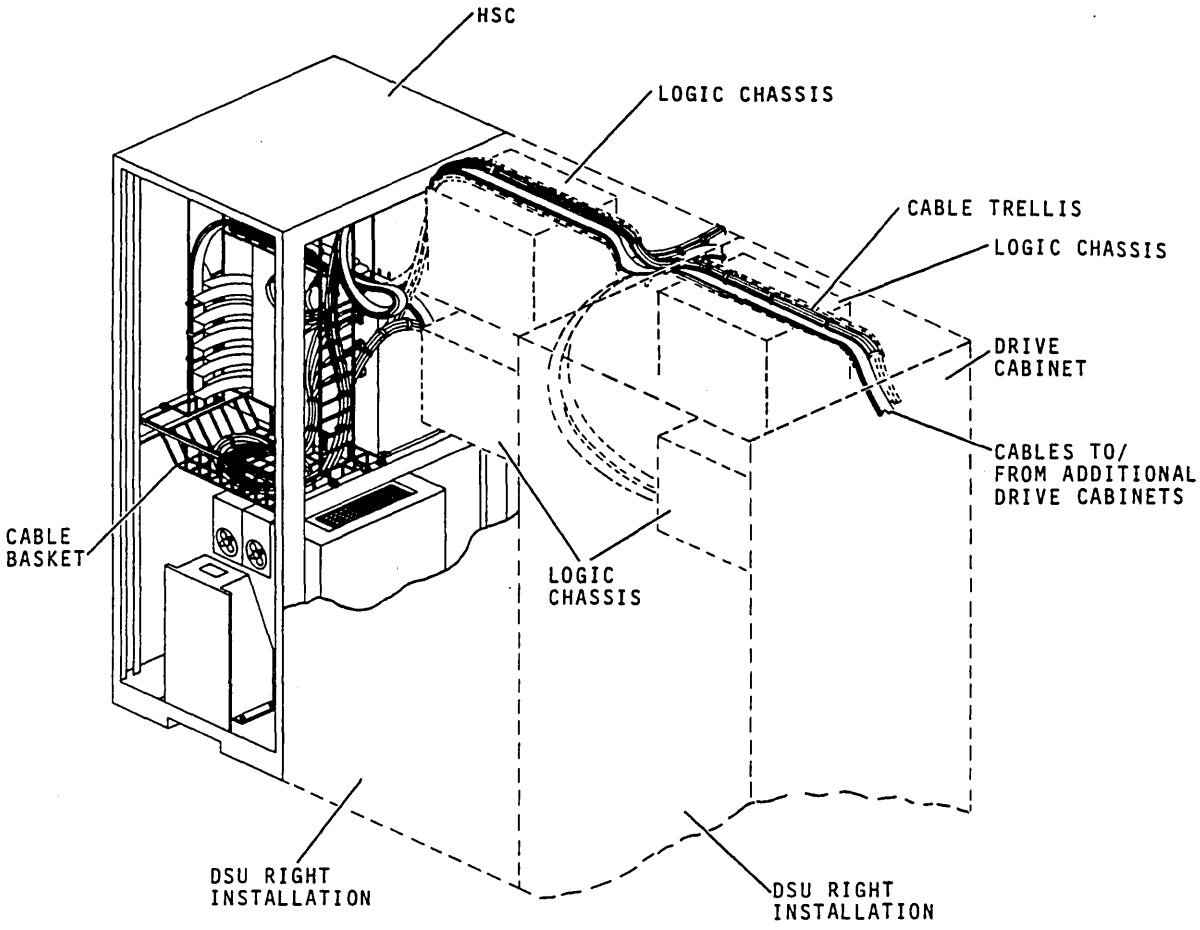


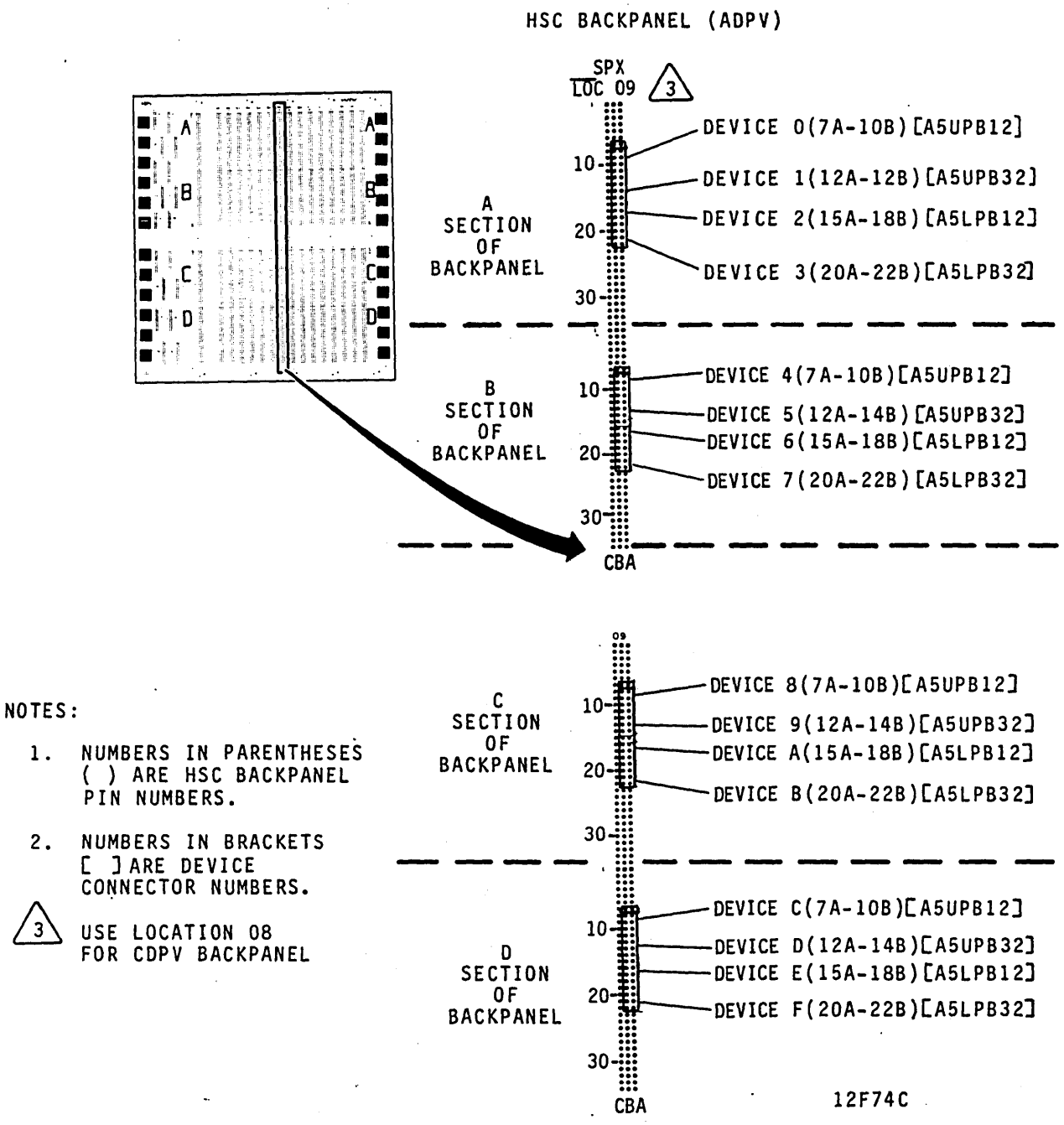
Figure 4E-22. HSC/DSU Cable Routing

the cable trellis as necessary. Excess cabling should be coiled and placed in the trellis basket in the HSC. Table 4E-16 provides low speed cabling information for cabling from the HSC to the DSU. This table is organized like the backpanel with connections starting from the top to the bottom.

High speed cables (round read/write) are connected between the HSC's backpanel and the appropriate device connector. Labels are furnished for the cable sets supplied with each drive. Mark the labels to identify device connectors as desired and attach them to those device connectors before routing the cables through the string of drives. Figure 4E-23 shows where device connectors plug onto backpanel pins of the HSC; and therefore, illustrates one method of labeling device connectors.

TABLE 4E-16. LOW SPEED CABLING

Backpanel Connector	Drive	Device	Cable ID Number
J/P41	3	D	A5UPA30
J/P43	3	F	A5LPA30
J/P20	1	4	A5UPA10
J/P22	1	6	A5LPA10
J/P21	1	5	A5UPA30
J/P23	1	7	A5LPA30
J/P33	2	B	A5UPA10
J/P31	2	9	A5UPA30
J/P12	0	2	A5LPA10
J/P13	0	3	A5LPA30
J/P10	0	0	A5UPA10
J/P11	0	1	A5UPA30
J/P42	3	E	A5LPA10
J/P40	3	C	A5UPA10
J/P32	2	A	A5LPA10
J/P30	2	8	A5LPA30



NOTES:

1. NUMBERS IN PARENTHESES ( ) ARE HSC BACKPANEL PIN NUMBERS.
2. NUMBERS IN BRACKETS [ ] ARE DEVICE CONNECTOR NUMBERS.

3 USE LOCATION 08 FOR CDPV BACKPANEL

Figure 4E-23. High Speed Cabling

Route the high speed cables through the cable trellis along the top of the DSU cabinets starting with the last DSU in the string. Then route the cables down the side of the trellis basket and connect the plugs into the HSC backpanel. One cable assembly services two devices; therefore, HSC connectors are labelled with two sets of pin numbers (7A-14B and 15A-22B). Figure 4E-23 illustrates the installation positions of HSC-end connectors on the HSC backpanel at location 09 and the pins (in parentheses) which those connectors cover. Connector numbers at the device end of the cable(s) are shown in brackets. Although not shown on figure 4E-23, all device connectors have the same pin numbers 4B through 9B.

DDC INTERFACE

The Director to Device Controller (DDC) interface mates the HSC to the storage director within a storage control via two connectors and a 24-twisted pair cable assembly. If the HSC has two controllers, then the interface hardware doubles to four connectors and two cable assemblies (see figures 4E-24 and 4E-25). The DDC cables also connect the HSCs in a daisy-chain configuration. The maximum accumulated length (for one or two HSCs) of each of these cables is 61 metres (200 feet), including 10 feet of internal HSC cabling to the second HSC. Table 4E-17 lists the various lengths of DDC I/O cables available.

NOTE

Before proceeding further, check the HSC's Serdes/PLO boards (type _SNX and _SPX). Refer to table 4E-15 for their locations.

If the boards are not MSNX and NSPX (or above), then you cannot use table 4E-18. The only allowable cable lengths are 30 and 180 feet, or else 180 and 30 feet.

Before installing DDC cables, check the cables supplied with the subsystem against table 4E-18. Use the first column if there is only one HSC. Verify that this cable length has an "X" (indicating a legal cable length). This column also applies for the cable from the storage director to the first HSC if there are two HSCs.

If there are two HSCs in the string, verify that the cable length to the first HSC has an "X" and ensure that the length of the cable from HSC1 to HSC2 also has an "X" in its corresponding table column.

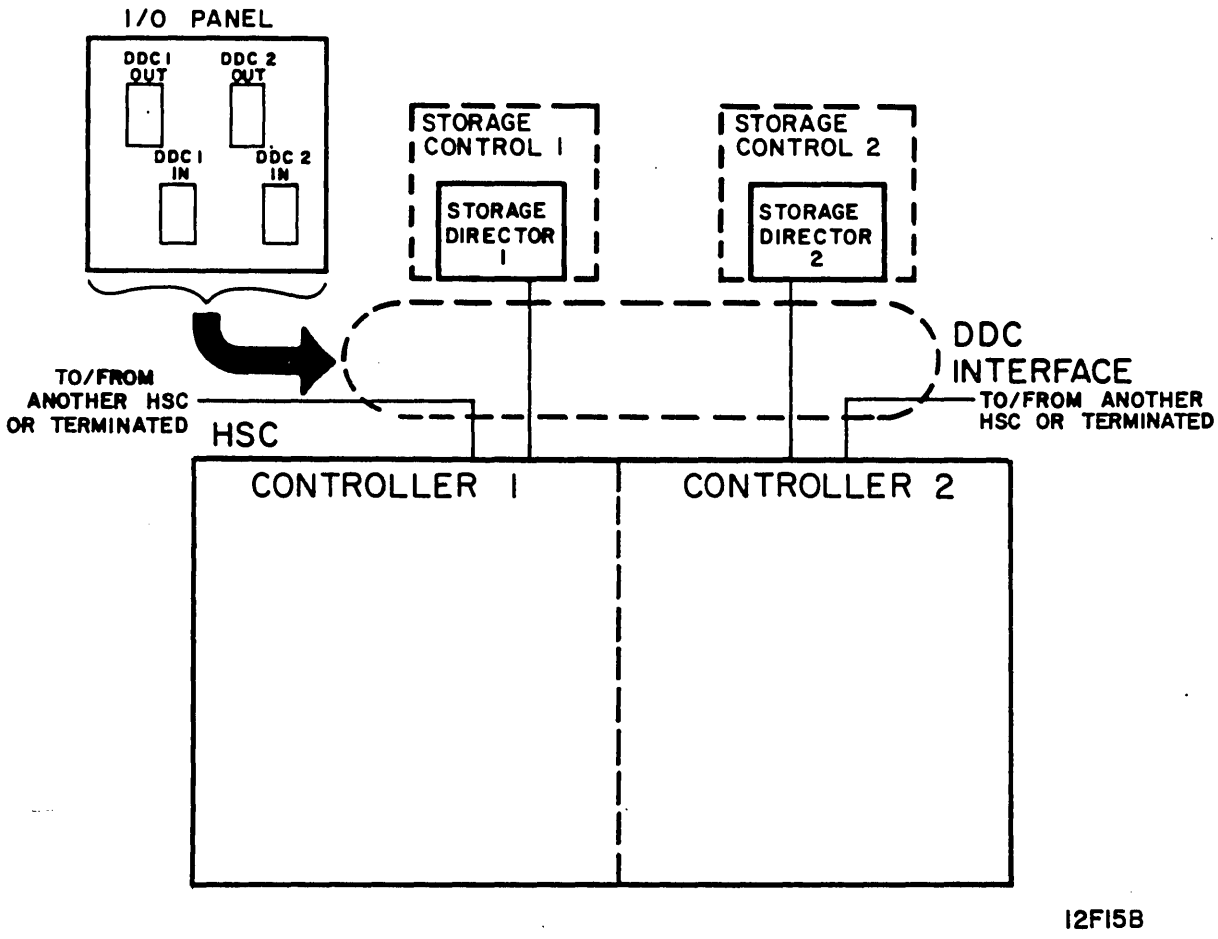


Figure 4E-24. DDC Interface Cabling

Although figure 4E-25 does not show it, the HSC is shipped with A1PA5 connected in place on the backpanel and A2P1 and A2P2 trailing from the logic chassis. These cables are connected at the time of installation to the _GVN board on the I/O panel as shown in figure 4E-24.

DDC cables are shipped with several inches of the outer plastic covering removed near one end of the cable to expose the braided shield. At installation be sure to locate the cable clamp over the braided shield (see figure 4E-25) and tighten the hex screw securely to the HSC's frame.

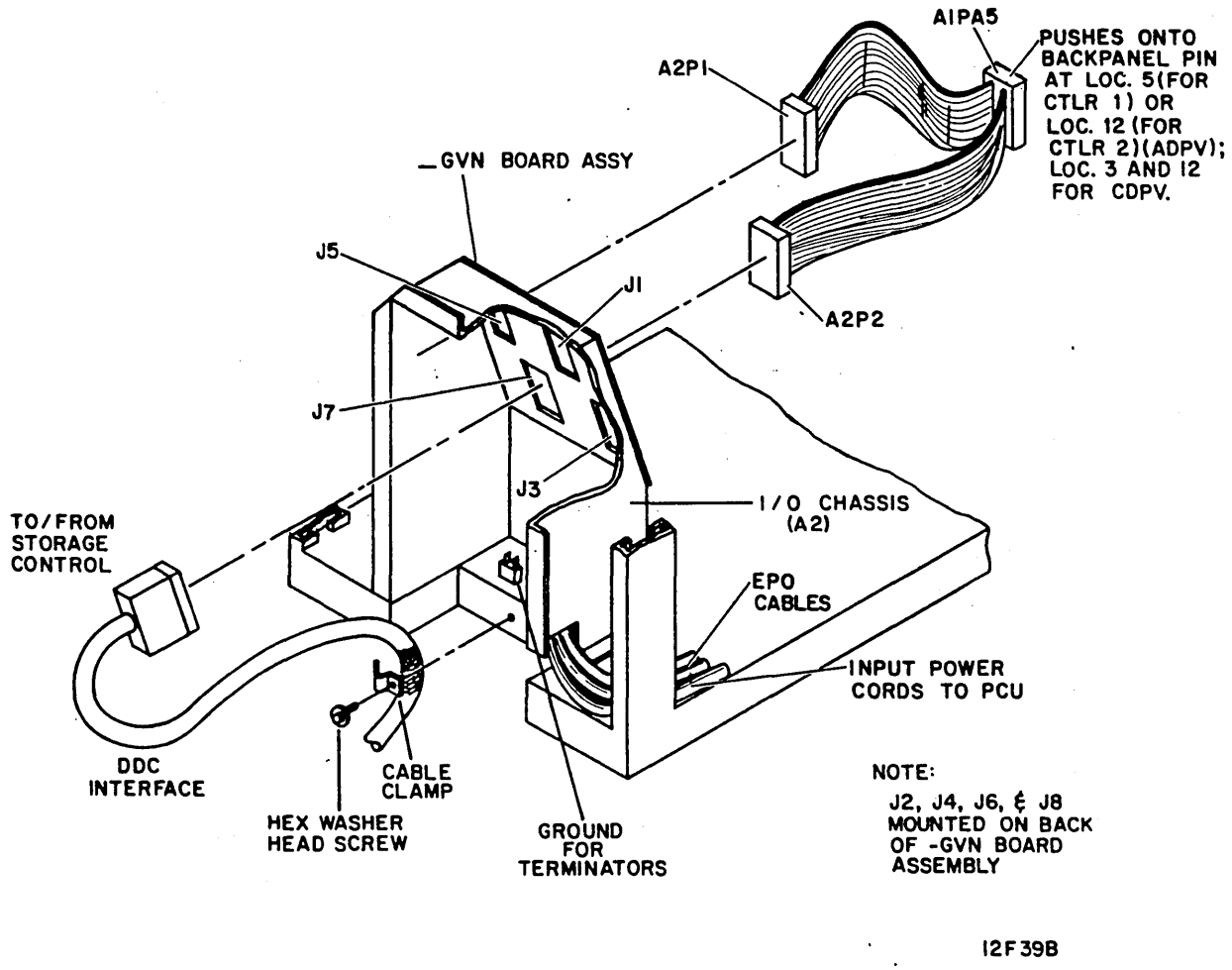


Figure 4E-25. DDC Interface Installation

Connect the DDC interface cable to J7 (DDC 1 IN). Terminate J5 (DDC 1 OUT) with terminator P/N 75268902. Connect ground wire (part of the cable assembly) to one of the spade lugs on the ground for terminators as shown in figure 4E-25.

NOTE

The _GVN board is exploded from the I/O panel in figure 4E-25 for plug orientation purposes only.

TABLE 4E-17. DDC I/O CABLES

Part	Length (metres)	Part Number
DDC I/O Cables	6 (20 ft)	83634302
	9 (30 ft)	83634303
	12 (40 ft)	83634304
	15 (50 ft)	83634305
	18 (60 ft)	83634306
	24 (80 ft)	83634307
	30 (100 ft)	83634308
	37 (120 ft)	83634309
	43 (140 ft)	83634310
	49 (160 ft)	83634311
	55 (180 ft)	83634312
	61 (200 ft)	83634313
NOTE: DDC I/O Cable - 1 per DDC port used (2 maximum)		

TABLE 4E-18. ALLOWED DDC CABLE LENGTHS

SCU to Single HSC or SCU to HSC1		Then the allowable daisy-chained cables from HSC1 to HSC2 can be:											
		20	30	40	50	60	80	100	120	140	160	180	200
20	X						X	X	X	X	X		
30	X						X	X	X	X	X		
40	X					X	X	X	X	X			
50													
60													
80													
100													
120	X	X	X	X	X	X							
140	X	X	X	X	X								
160	X	X	X										
180	X												
200	X												

NOTES:

1. All cable lengths are in feet.
2. X indicates lengths to single HSC or combinations of daisy-chained lengths that are allowed. All others are disallowed.
3. Units now using 30 and 180-foot cables (or 180 and 30-foot cables) may continue to use them even though this chart disallows those combinations.

EPO CABLING

EPO cabling is routed from the I/O panel of the storage control to the rear panel of the HSC's PCU. The cable from storage director 1 is connected to J5 (figure 4E-26) and the cable from storage director 2 is connected to J6. Also, be sure to attach the quick connect clip (attached to the trailing black ground wire with each cable assembly), to the ground terminal next to both connectors J5 and J6.

If it becomes necessary to order additional EPO cables, refer to table 2D-2 in Section 2D of this manual.

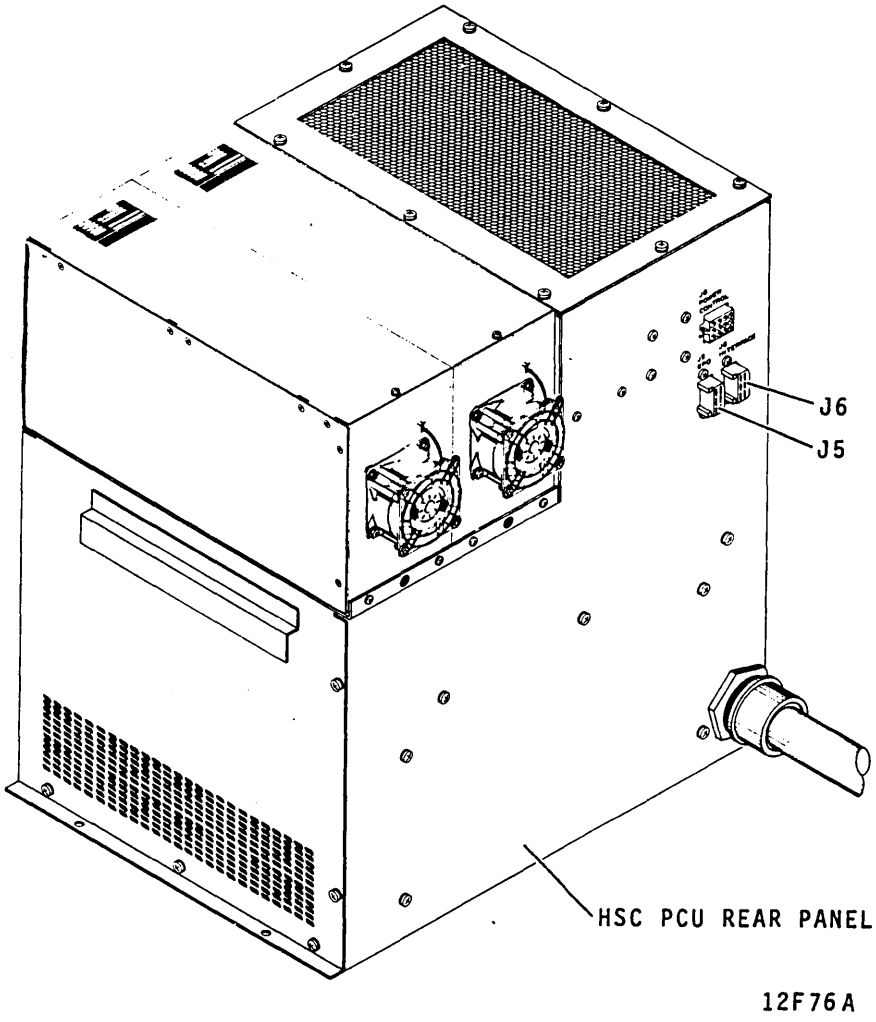


Figure 4E-26. HSC EPO Cable Connections

ADDRESS AND JUMPER SELECTIONS

CAUTION

Observe all electrostatic precautions in the applicable maintenance manual. Before performing any of these procedures, all power must be off in the HSC or DSU.

All switches in the following procedures are located on the edge of the board. Before setting any switches, observe the position and type of switch on the board since position and type of switch may differ.

The Device Selection procedure must be repeated for each device within every DSU in the string. The Controller Selection, Controller ID and Sequencer Board procedures apply to the HSC.

DEVICE SELECTION

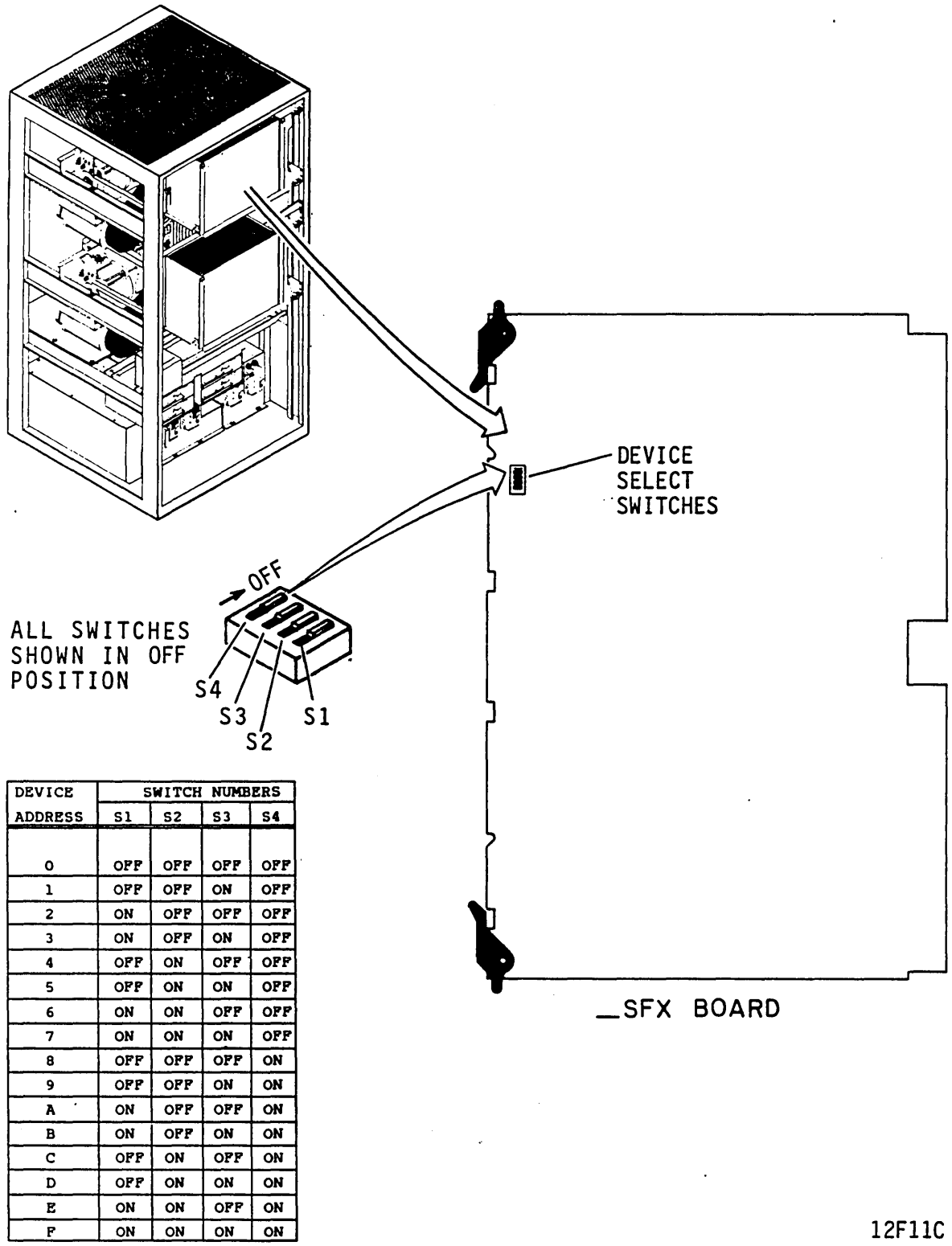
Device address selections are made on the _SFX I/O Transmitter/Receiver board at locations A10/A30 in the upper and lower logic chassis of the DSU. Figure 4E-27 shows the locations of these switches on the _SFX board and the resulting addresses produced by the switch settings as shown.

CONTROLLER SELECTION

NOTE

Refer to table 4E-15 for a chart comparing board locations between the ADPV and CDPV backpanels.

Controller logical addresses are selected by the proper placement of jumper blocks over backpanel pins opposite the _SKX board slots. Refer to figure 4E-28 and note that a jumper block covers only two rows of pins. In the figure, the position of the jumper block at location 05 (ADPV backpanel only) illustrates an address of logical zero for controller 1; the position of the other jumper block at location 12 (either backpanel) illustrates an address of logical one for controller 2. Either address may be selected for either controller.



DEVICE ADDRESS	SWITCH NUMBERS			
	S1	S2	S3	S4
0	OFF	OFF	OFF	OFF
1	OFF	OFF	ON	OFF
2	ON	OFF	OFF	OFF
3	ON	OFF	ON	OFF
4	OFF	ON	OFF	OFF
5	OFF	ON	ON	OFF
6	ON	ON	OFF	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	OFF	OFF	ON	ON
A	ON	OFF	OFF	ON
B	ON	OFF	ON	ON
C	OFF	ON	OFF	ON
D	OFF	ON	ON	ON
E	ON	ON	OFF	ON
F	ON	ON	ON	ON

Figure 4E-27. Device Selections

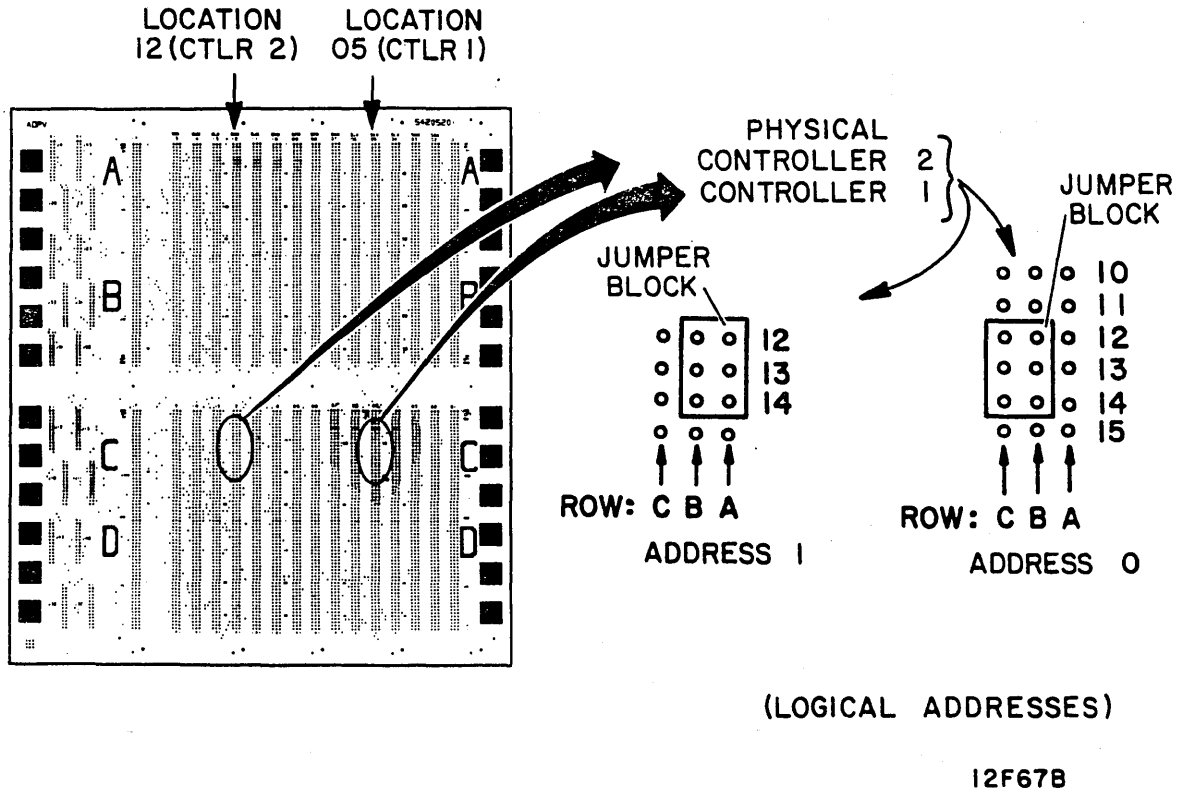


Figure 4E-28. Controller Jumper Block Installation (ADPV Backpanel Shown)

CONTROLLER IDENTIFICATION

NOTE

Refer to table 4E-15 for a chart comparing board locations between the ADPV and CDPV backpanels.

Prior to, or at the time of installation, physical identifiers are assigned to the controllers within an HSC. The rules governing the assignment of physical identifiers depend upon the configuration of the storage subsystem. Figure 4E-29 illustrates a few of the most probable configurations likely to be required at a typical site. The eight switches on the _SLX

board(s) in location(s) 04 (ADPV backpanel only) and/or 13 are set to correspond to the physical identifiers previously assigned. Each two-character hexadecimal physical identifier must be used only once at each customer location and ideally should never be changed. .

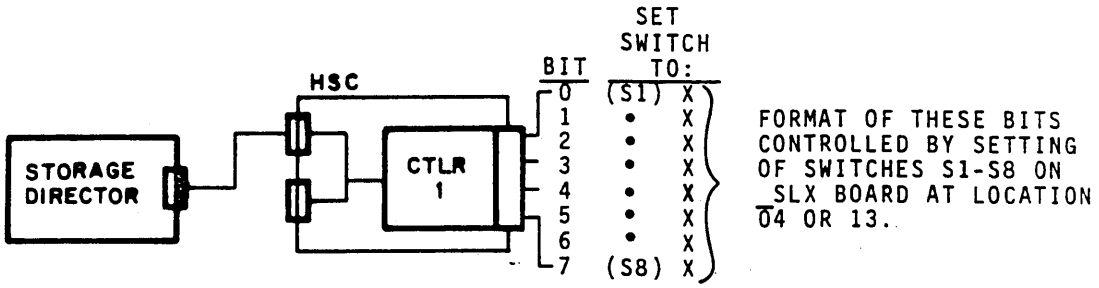
The general rules for determining how to choose HSC physical identifiers are as follows:

If B/P Jumper Block is ON: *	Then, CTLR Logical Address is	And, set HSC ID switches SW2 - SW7 to Desired Hex Addresses †
Type _SKX pins 12, 13 & 14, rows B & C	0	Even addresses only in address range 02-7E (on _SLX board for controller 1) AND Odd addresses only in address range 03-7F (on _SLX board at location 13)
Type _SKX pins 12, 13, 14, rows A & B	1	Even addresses only in address range 82-FC (on _SLX board for controller 1) AND Odd addresses only in address range 83-FD (on _SLX board at location 13)

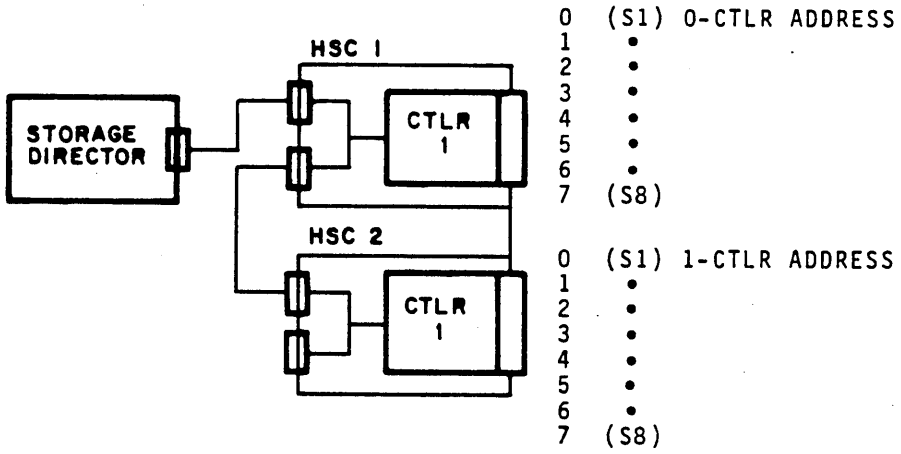
NOTES: * Note that this column is for the type _SKX board (either controller 1 or controller 2).

† Note that this column is for the type _SLX board. Do not use 00, 01 FE & FF for physical identifier numbers.

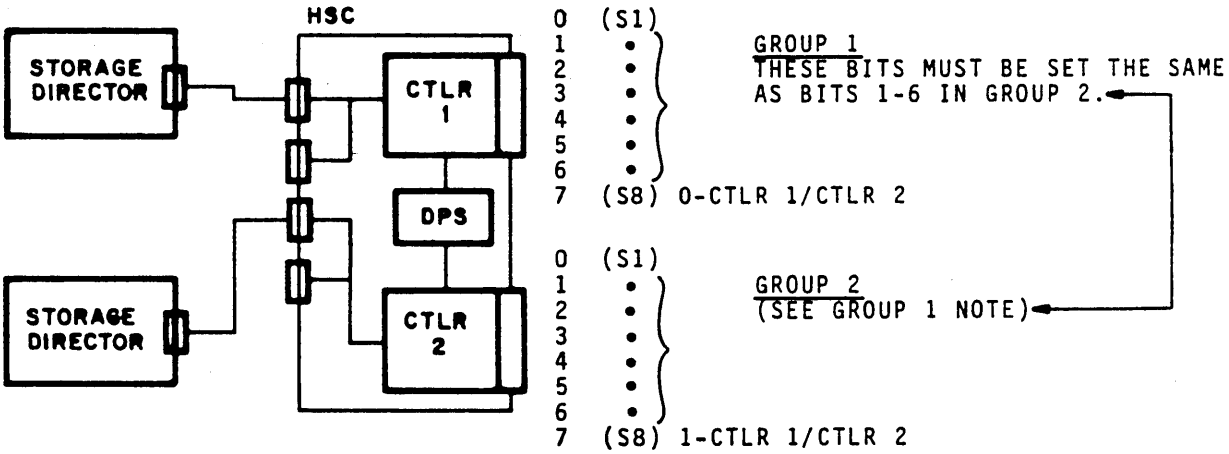
In HSCs having two controllers, two physical identifier numbers are needed. These two numbers must be consecutive and the smaller number must be an even number. For example: 04 and 05, 26 and 27 are valid sets of numbers to use; 07 and 08, 11 and 12 are not valid because the smaller number is not even. The even number must be assigned to controller 1.



VIEW A – ONE SD, ONE HSC W/ONE CTLR



VIEW B – ONE SD, TWO HSCs (DAISY-CHAINED) W/ONE CTLR EACH



VIEW C – TWO SDs, ONE HSC W/DPS AND TWO CTLRs

12F86-1

Figure 4E-29. Typical Installation Configurations
(Sheet 1 of 2)

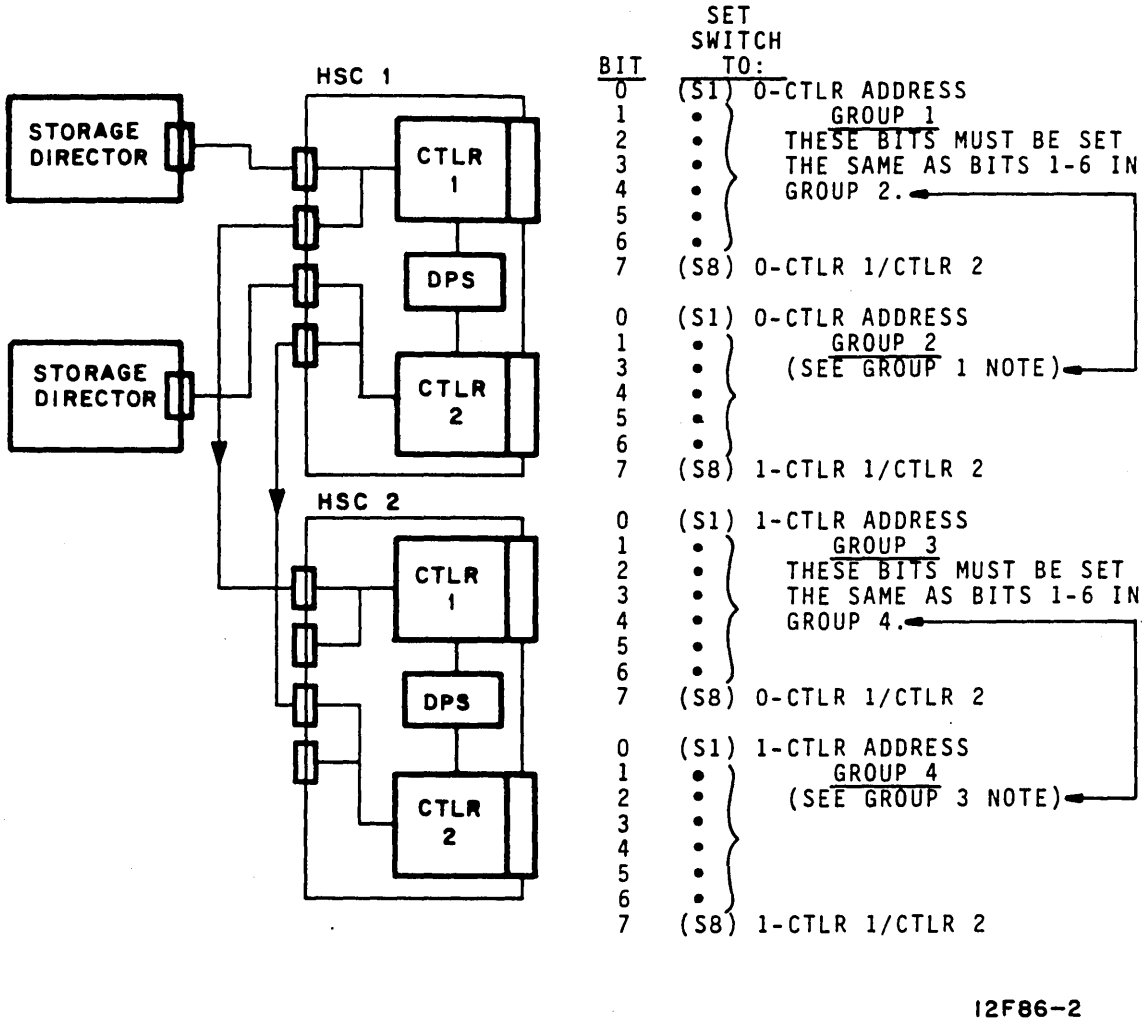


Figure 4E-29. Typical Installation Configurations (Sheet 2)

For HSCs having only one controller, only one physical identifier is needed and it may be odd or even.

Bit 0 and bit 7 (switches SW1 and SW8 on the _SLX boards) are of particular interest to the installer. Examine these two bit positions in the examples shown in figure 4E-29 and note the differences that would be required in switch settings, especially in HSCs having the DPSE feature.

Basically, the switch for bit 0 (SW1) is set to represent the address of either controller in HSCs having two controllers. Bit 7 (SW8) is set to distinguish between controller 1 or controller 2 (right and left, respectively, as viewed from the pin side of the backpanel). Also, note the identifying labels CTLR 1 and CTLR 2 on the backpanel.

Proceed as follows:

NOTE

This procedure assumes switches are being set on an ADPV backpanel. Refer to table 4E-15 for a chart comparing board locations between the ADPV and CDPV backpanels.

1. Set SW1 (bit 0, labeled Controller Address on figure 4E-30) to match the backpanel jumper installation as shown on figure 4E-28. For example, if the jumper block was installed over the B and C rows of pins at backpanel location 05 (resulting in the logical address of 0) then set SW1 on the _SLX board at location 04 to ON.

2. Next, set SW8 (bit 7 labeled Controller 2 on figure 4E-30) to establish the identity of controller 1 and 2. If the HSC has two controllers set SW8 on the _SLX board at location 13 to ON (closed) and SW8 on the _SLX board at location 04 to OFF (open). These settings identify the left controller as CTLR 1 and the right controller as CTLR 2.

3. Finally, set the six HSC physical identifier switches (SW2 - SW7 on figure 4E-31 at locations 04 and 13 as follows:

   - Select hexadecimal numbers to identify the HSC cabinets.

   - Convert the hexadecimal numbers to their binary equivalents as shown as an example in figure 4E-29.

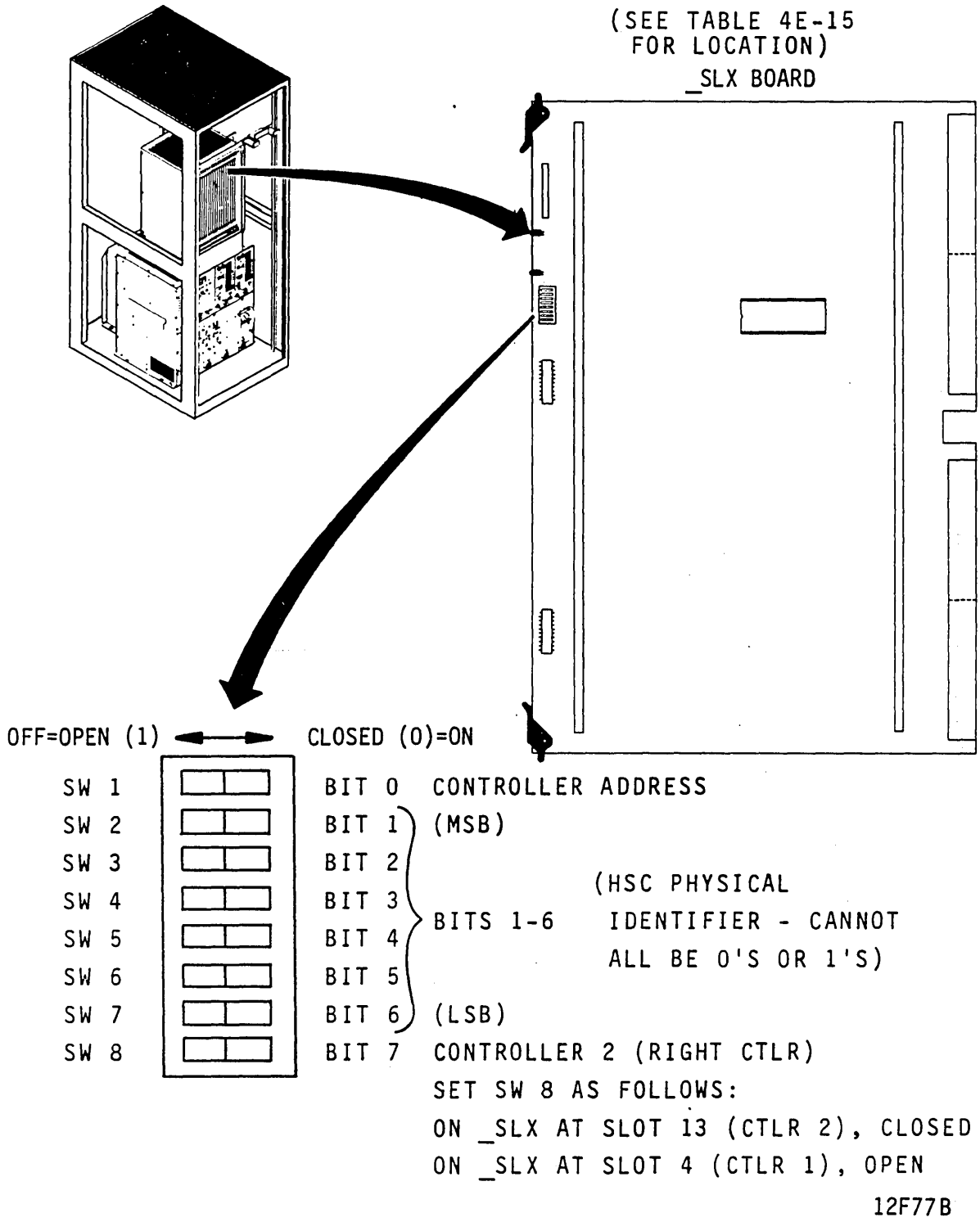


Figure 4E-30. Controller Physical Identification

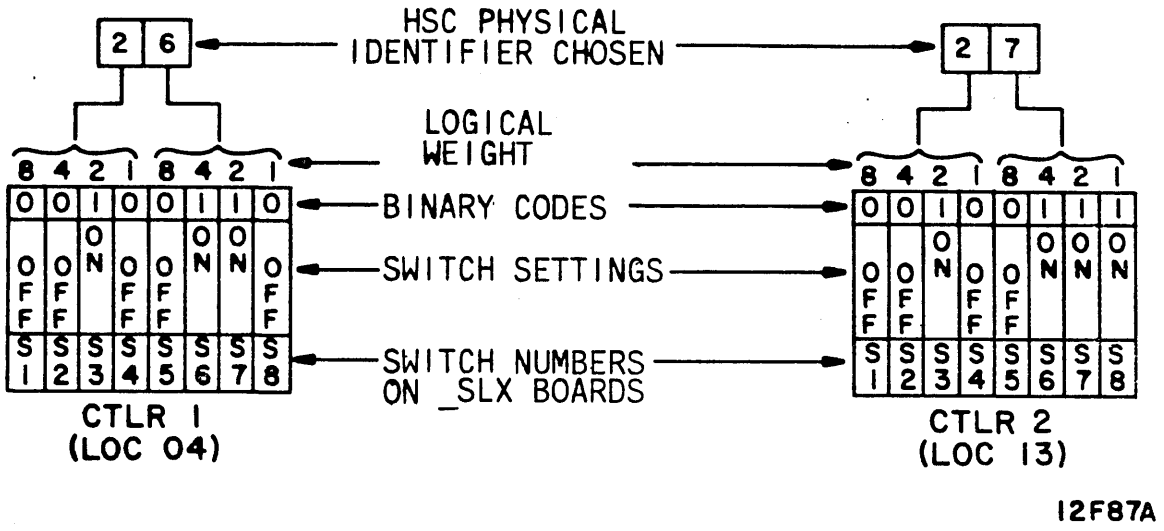


Figure 4E-31. HSC ID Conversion Example

In the example (figure 4E-31), remember that both SW1 and SW8 have already been set to desired positions for both controllers. Therefore, only six bits are actually available for conversion to binary code. It follows, then, that the decoded logical values for bits 0 and 7 (resulting from the HSC physical identifiers chosen) must be identical to the logical values already established when SW1 and SW8 were set previously.

TRACE ENCODE AND DPSE SWITCH SETTINGS

The Trace Encode Switches, which are used in troubleshooting, are located on the HSC's Processor-Sequencer board (_SJX). Refer to table 4E-15 for a chart comparing board locations between the ADPV and CDPV backpanels. Since these switches are set to various positions as needed by the troubleshooter, you should leave all four switches (SW1 - SW4) in the off (open) positions. Figure 4E-32 shows the location of these switches on the board.

If two controllers are installed in the same HSC cabinet, set the DPSE switch in both controllers to the closed position (see figure 4E-32).

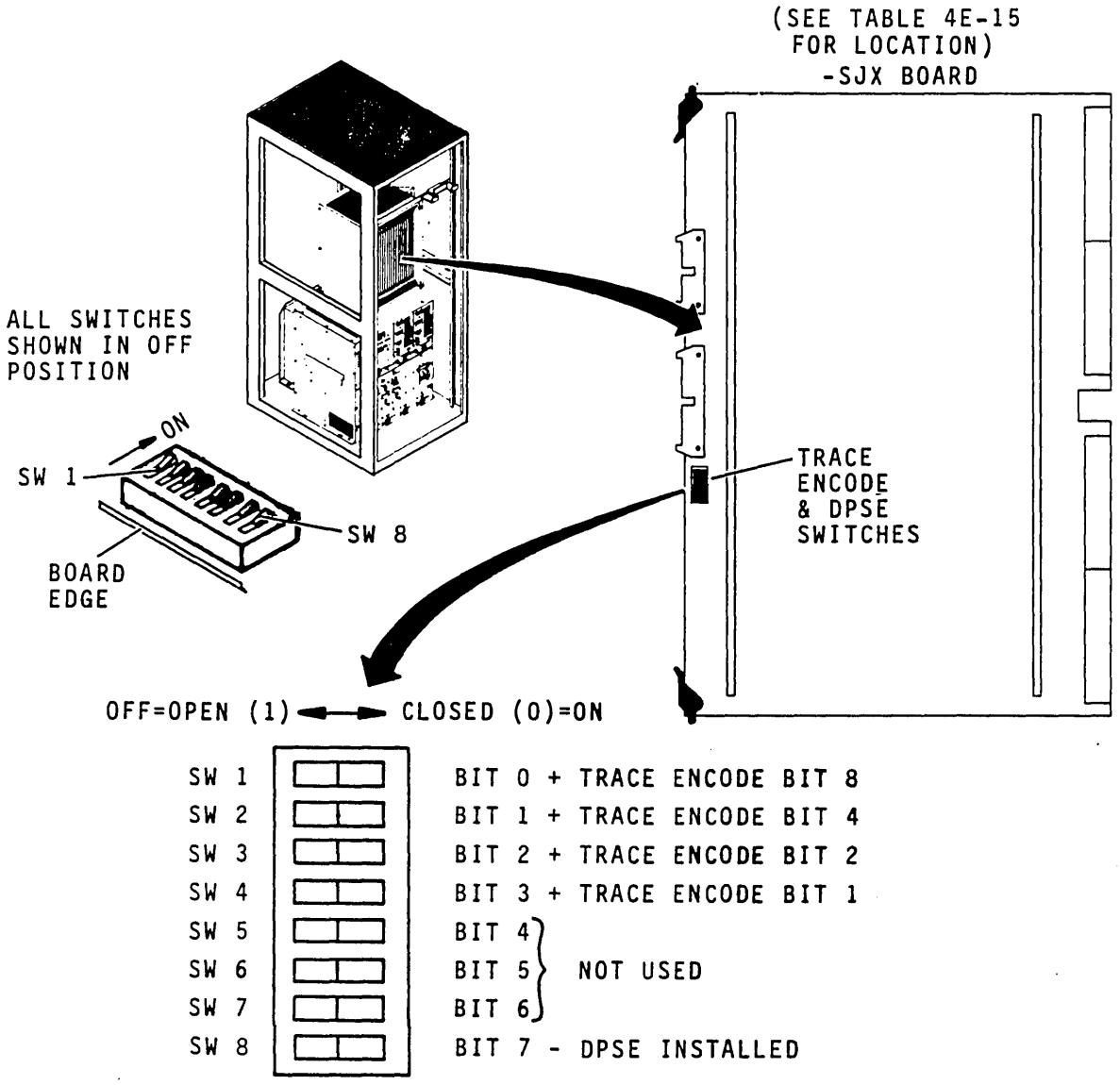


Figure 4E-32. Trace Encode and DPSE Switch Locations

FINAL VISUAL CHECKS

Before applying power to any unit make the following visual checks:

1. Check that all connectors on the DC power supply modules and PCUs are firmly seated.

2. Check that all backpanel connectors are firmly seated and that the terminating jumpers are installed over the proper pins.

3. Check that all logic boards have been installed and are firmly seated in the board slots.

4. Check that all read/write, controller to device port (CDP), and device to director cables (DDC) cables are properly mated and firmly seated.

FINAL CHECKOUT

NOTE

Before putting subsystems having the DPSE feature online, refer to the Hardware Diagnostic Reference Manual, (publication number 83324410) for specific DPSE Array Procedures and Precautions procedure.

Procedures for diagnosing the proper operation of each device, are found in the Hardware Diagnostic Reference Manual (publication number 83337530).

INITIAL STARTUP

For initial startup and operating procedures, refer to the Hardware Reference Manual (publication number 83337500).

REPACKAGING

If it becomes necessary to repackage a unit for reshipment, packaging instructions may be obtained from:

Packaging Engineer, Material Services Department
Magnetic Peripherals, Inc.
7801 Computer Avenue
Minneapolis, MN 55435

SECTION 5

IBM 3333 CONTROLLER/3330 DRIVE INSTALLATION

IBM 3333 CONTROLLER/3330 DRIVE INSTALLATION 5

INTRODUCTION

A subsystem may consist of one or more strings of IBM 3330-type drives intermixed with CDC drives.

PROCEDURES

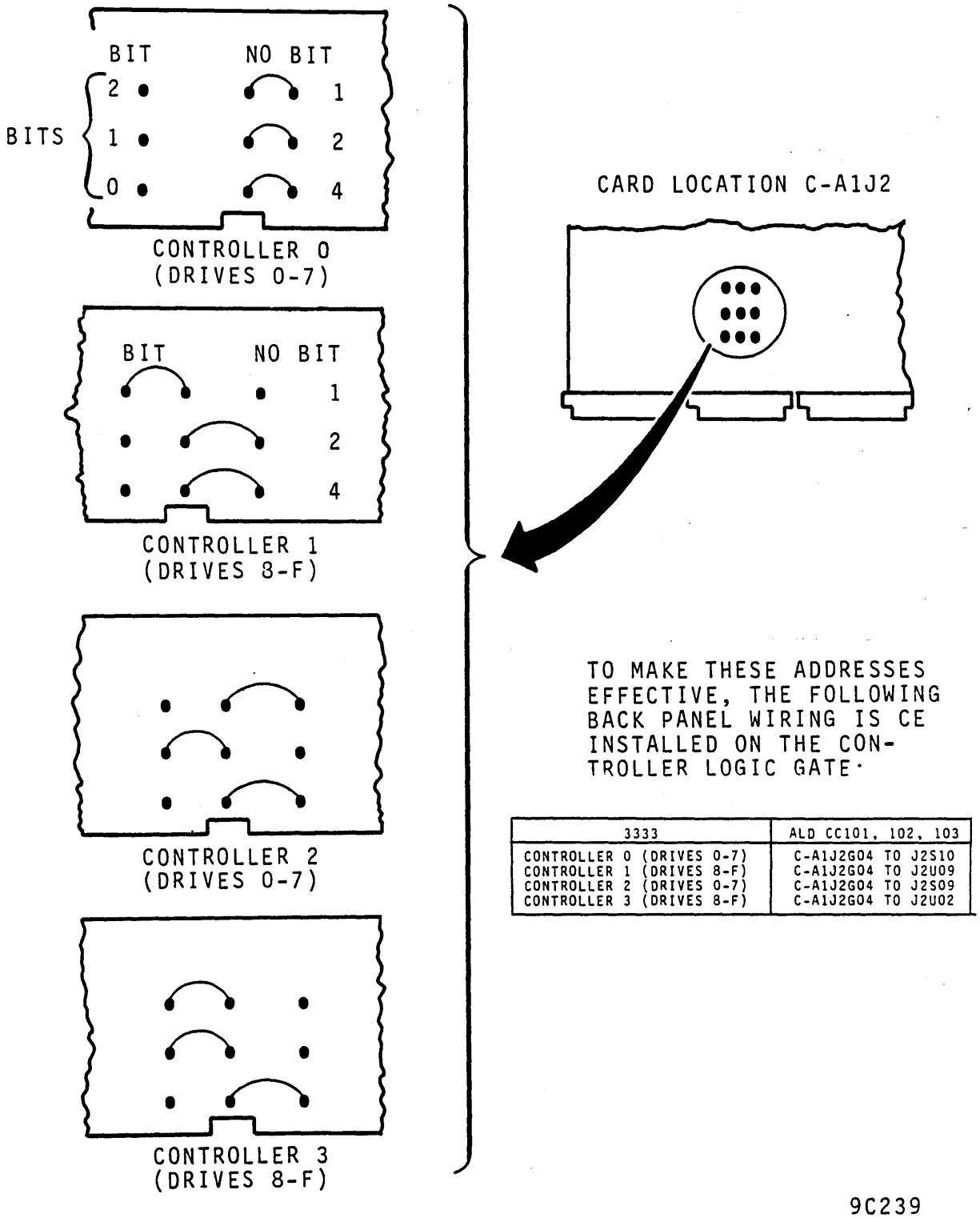
The following procedures enable CDC maintenance personnel to reconfigure IBM drives into a mixed CDC/IBM subsystem. It is assumed that the IBM equipment is already operation on site. Additional information on the installation of IBM drives may be found in the corresponding controller/drive maintenance library.

CONTROLLER ADDRESS SELECTION

Figure 5-1 illustrates the addressing jumper card within the 3333 controller. A separate address must be wired for each channel port.

DRIVE ADDRESS SELECTION

Figure 5-2 illustrates the addressing jumper card within the 3330 device.



3333	ALD CC101, 102, 103
CONTROLLER 0 (DRIVES 0-7)	C-A1J2G04 TO J2S10
CONTROLLER 1 (DRIVES 8-F)	C-A1J2G04 TO J2U09
CONTROLLER 2 (DRIVES 0-7)	C-A1J2G04 TO J2S09
CONTROLLER 3 (DRIVES 8-F)	C-A1J2G04 TO J2U02

Figure 5-1. 3333 Controller Addressing

A MANUALLY INSTALLED JUMPER IS USED TO DEFINE THE ADDRESS ON STAGE I UNITS AS SHOWN IN THE FOLLOWING TABLE:

	JUMPER FROM						
DRIVE	V3B02	V3B03	V3B04	V3B05	V3B06	V3B07	JUMPER TO
A	M2P11	M2P04	M2P05	.....	.....	.....	
B	M2P11	M2P04	.....	.....	.....	M2P05	
C	M2P11	.....	M2P04	.....	M2P05	.....	
D	M2P11	.....	.....	.....	M2P04	M2P05	
E	.....	M2P11	M2P04	M2P05	.....	.....	
F	.....	M2P11	.....	M2P04	.....	M2P05	
G	.....	.....	M2P11	M2P04	M2P05	.....	
H	.....	.....	.....	M2P11	M2P04	M2P05	

ADDRESSING DRIVE LOGIC BOARD PART NUMBERS:
2276210, 2354252, and 2354250

A JUMPER CARD LOCATED IN POSITION Y5 IS USED TO DEFINE THE ADDRESS ON STAGE II UNITS. THE FOLLOWING TABLE LISTS THE PART NUMBERS USED TO DEFINE EACH LOGICAL ADDRESS:

ADDRESS	PART NUMBER	ADDRESS	PART NUMBER
A	2311176	E	2311180
B	2311177	F	2311181
C	2311178	G	2311182
D	2311179	H	2311183

CHECK THE DEVICE TYPE SELECTION USING THE CHART BELOW.

MODEL	BOARD P/N	P/N OF CARD AT Y2
1	2311190	NONE
1 or 2	2276210	2311176
1 or 2	2354250	NONE
11	2354250 or 2354252	2311180

9C237A

Figure 5-2. 3330 Device Addressing (Sheet 1 of 2)

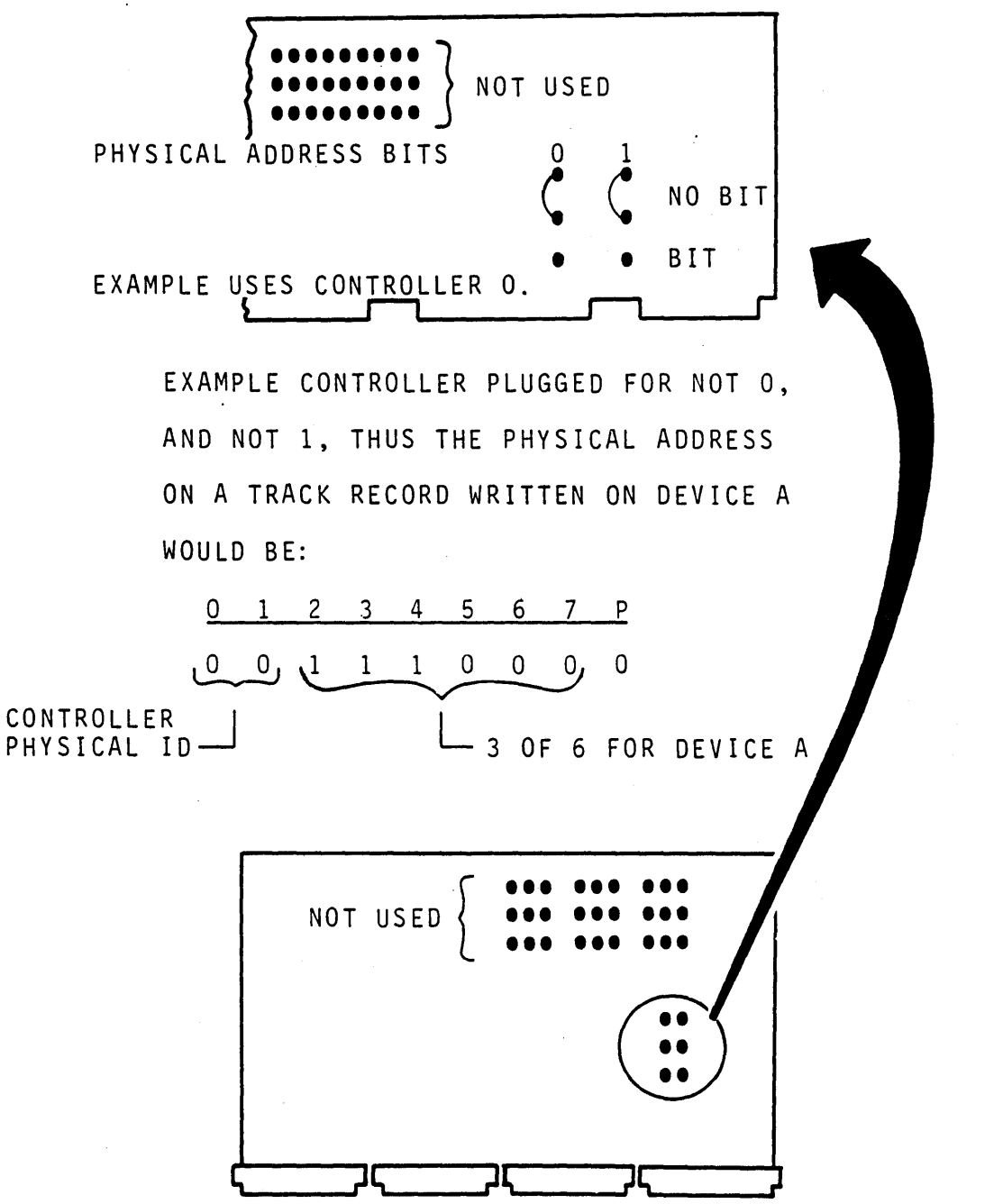


Figure 5-2. 3330 Device Addressing (Sheet 2)

SECTION 6

IBM 3350 CONTROLLER/DRIVE INSTALLATION

IBM 3350 CONTROLLER/DRIVE INSTALLATION 6

INTRODUCTION

A subsystem may consist of one or more strings of IBM 3350-type drives intermixed with CDC drives.

PROCEDURES

The following procedures enable CDC maintenance personnel to reconfigure IBM drives into a mixed CDC/IBM subsystem. It is assuemd that the IBM equipment is already operation on site. Additional information on the installation of IBM drives may be found in the corresponding controller/drive maintenance library.

CONTROLLER ADDRESS SELECTION

Figure 6-1 illustrates the addressing jumper card within the 3350 controller. A separate address must be wired for each channel port.

DRIVE ADDRESS SELECTION

Figure 6-2 illustrates the addressing jumper card within the 3350 device.

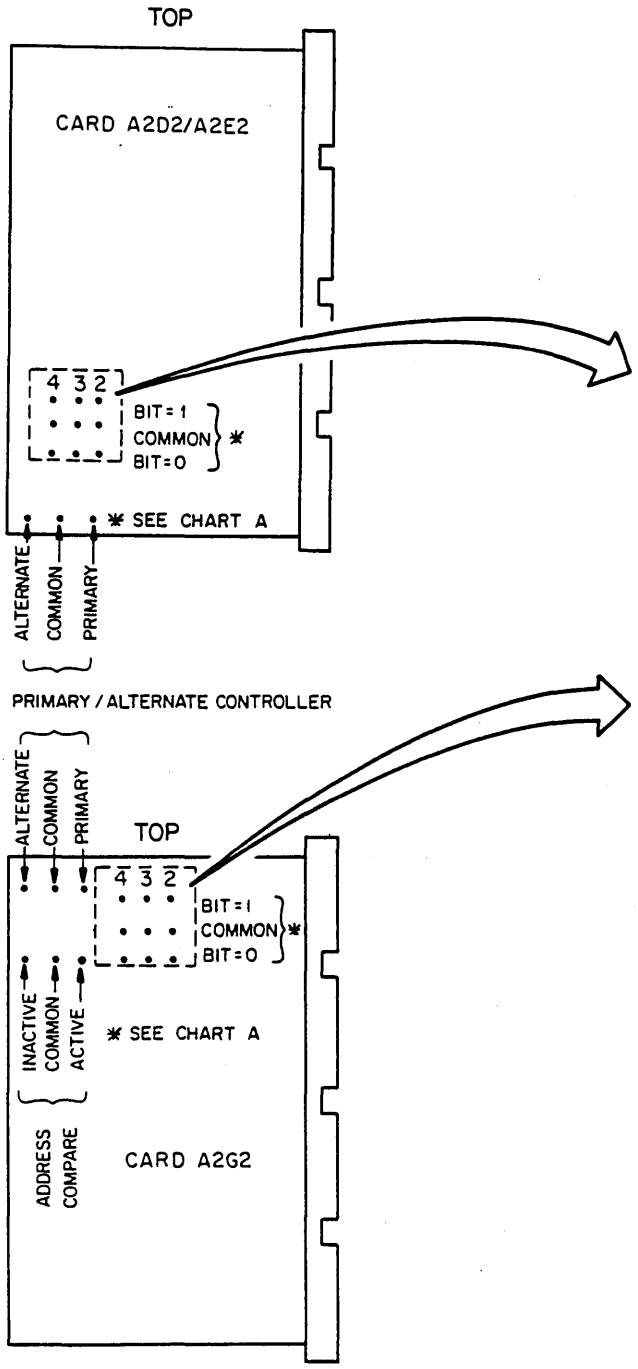


CHART A

CONTROLLER	PLUG	ADDRESSES
0		X00 – X07 X20 – X27 X40 – X47 X60 – X67 X80 – X87 XA0 – XA7 XC0 – XC7 XE0 – XE7
1		X08 – X0F X28 – X2F X48 – X4F X68 – X6F X88 – X8F XA8 – XAF XC8 – XCF XE8 – XEF
2		X10 – X17 X30 – X37 X50 – X57 X70 – X77 X90 – X97 XB0 – XB7 XD0 – XD7 XF0 – XF7
3		X18 – X1F X38 – X3F X58 – X5F X78 – X7F X98 – X9F XB8 – XBF XD8 – XDF XF8 – XFF

9C230A

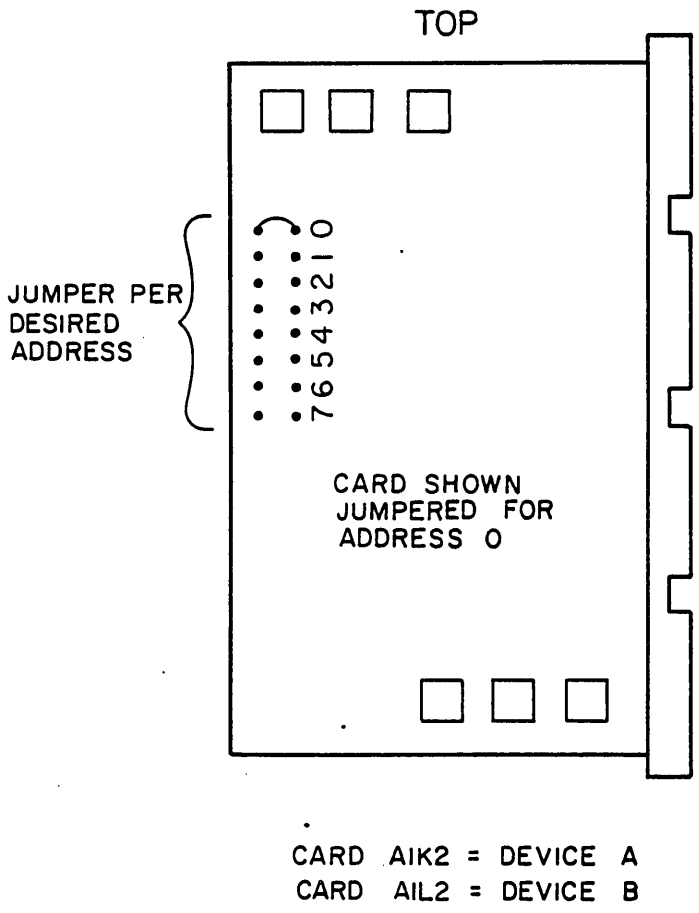


Figure 6-2. 3350 Device Addressing

APPENDIX A

CDC EQUIPMENT DETAILED ADDRESSING PROCEDURE

CDC EQUIPMENT DETAILED ADDRESSING PROCEDURE A

INTRODUCTION

This Appendix provides a step-by-step procedure for setting up the addresses in an all-CDC subsystem. The steps should be performed in sequence for each channel connected to the storage control, controller, and device. The steps are arranged to enable you to determine if your addressing scheme is valid. You should read through the entire appendix before starting, since several sample addressing schemes are provided.

NOTE

This procedure must be performed twice in subsystems using the FA113 dual storage control.

ADDRESSING

STEP 1 - BASIC FACTFINDING

Review the Site Planning Kit and confer with the customer to determine the following:

a. Total number of CPUs.

b. Total number of channels.

c. Total number of storage control units.

d. Total number of active controllers.

e. Total number of devices.

f. Total number of logical volumes.

g. Number of channels attaching to each storage control (1, 2, or 4 channels).

h. Number of storage controls attaching to each controller (1 or 2).

i. Number of controllers attaching to each device (1 or 2).

j. Total number of device addresses required per channel (maximum=32).

k. Total number of volume addresses required per channel (maximum=64).

l. Total number of addressing paths per volume. (This is important on single-CPU subsystems using alternate path retry or channel rotation features.)

m. Specific addresses requested by the customer for each channel.

STEP 2 - STORAGE CONTROL ADDRESSING

Go to sheet 1 of figure A-1 to find out which of the tables on sheets 2 through 14 should be used to validate the addressing scheme.

Go to the referenced sheet in the table. Find the column containing the addresses requested by the customer. All of the requested addresses must appear somewhere in the table; otherwise, different addresses must be selected. In addition, all of the requested addresses for a single channel must appear in one column; otherwise, different addresses must be selected.

NOTE

The same column can be used again for a different channel.

After selecting a column, follow the arrow from the top of the column to determine which bits of the subsystem address will be used to decode the storage control address.

STEP 3 - CONTROLLER ADDRESSING

Follow over to the left of the selected address column to determine the associated string (controller) address.

CONTROL STORE SIZE	SEQUENTIAL ADDRESSING	DRIVES ATTACHED TO STORAGE CONTROL			NUMBER OF CONTIGUOUS ADDRESS GROUPS	ADDRESS COMPARE SWITCH	
		HPD	1-VOL FMD	2-VOL FMD		SETTING	SHEET
4K	NO	YES	NO	NO	1 OF 16	0	2
6K	NO	YES	NO	NO	1 OF 32	1	3
8K	NO	—	—	NO	1 OF 8 (00-7F)	8	4
					1 OF 8 (80-FF)	8	5
					1 OF 16	0	2
					1 OF 32	1	3
					2 OF 8	9	6
		—	—	YES	1 OF 64	3	7
					2 OF 8	A	8
					2 OF 16	2	9
					4 OF 8	B	10
	YES	—	—		1 OF 16	0	11
					1 OF 32	1	12
					1 OF 64	3	13
					2 OF 16	2	14

HOW TO USE THIS CHART:

DETERMINE SYSTEM CONFIGURATION: CONTROL STORE CAPACITY, WHETHER SEQUENTIAL OR NON-SEQUENTIAL MICROPROGRAM IS INSTALLED, AND DRIVE TYPES ATTACHED TO STORAGE CONTROL (- = DON'T CARE). "NUMBER OF CONTIGUOUS ADDRESS GROUPS" COLUMN LISTS EACH OF THE ADDRESS RANGES THAT ARE VALID FOR EACH CONFIGURATION - - IF THE CUSTOMER REQUESTED ADDRESS RANGE IS NOT LISTED, EITHER THE SUBSYSTEM MUST BE RECONFIGURED OR ELSE THE CUSTOMER MUST CHANGE THE REQUESTED ADDRESS RANGE.

IF THE REQUESTED ADDRESSES ARE LEGAL, SET THE ADDRESS COMPARE SWITCH TO THE "SETTING" PROVIDED ABOVE. THEN PROCEED TO THE LISTED SHEET NUMBER OF THIS FIGURE FOR ADDRESS SWITCH AND BIT 4 JUMPER SETTINGS.

8G137-1

Figure A-1. Address Validation (Sheet 1 of 14)

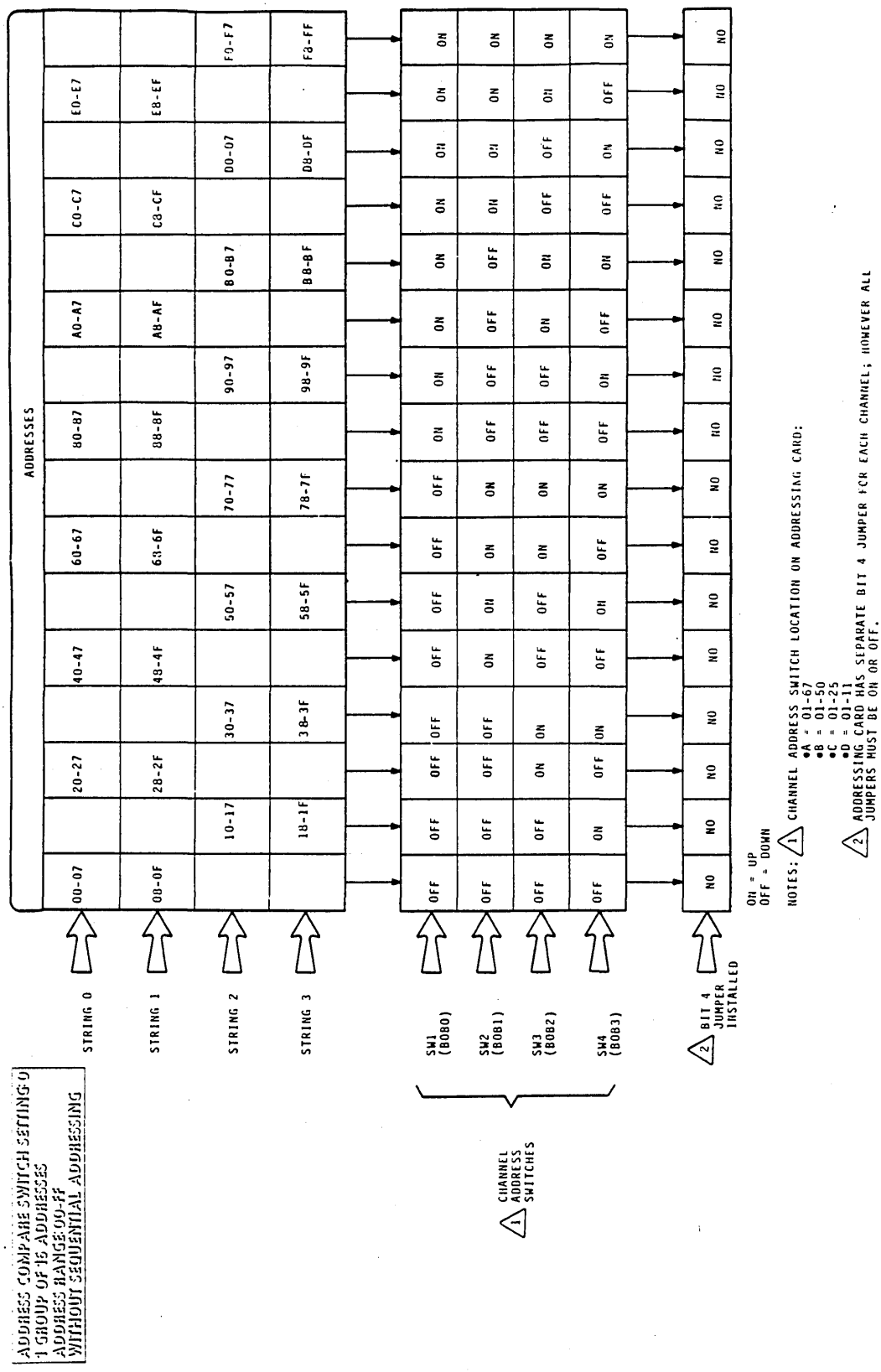


Figure A-1. Address Validation (Sheet 2)

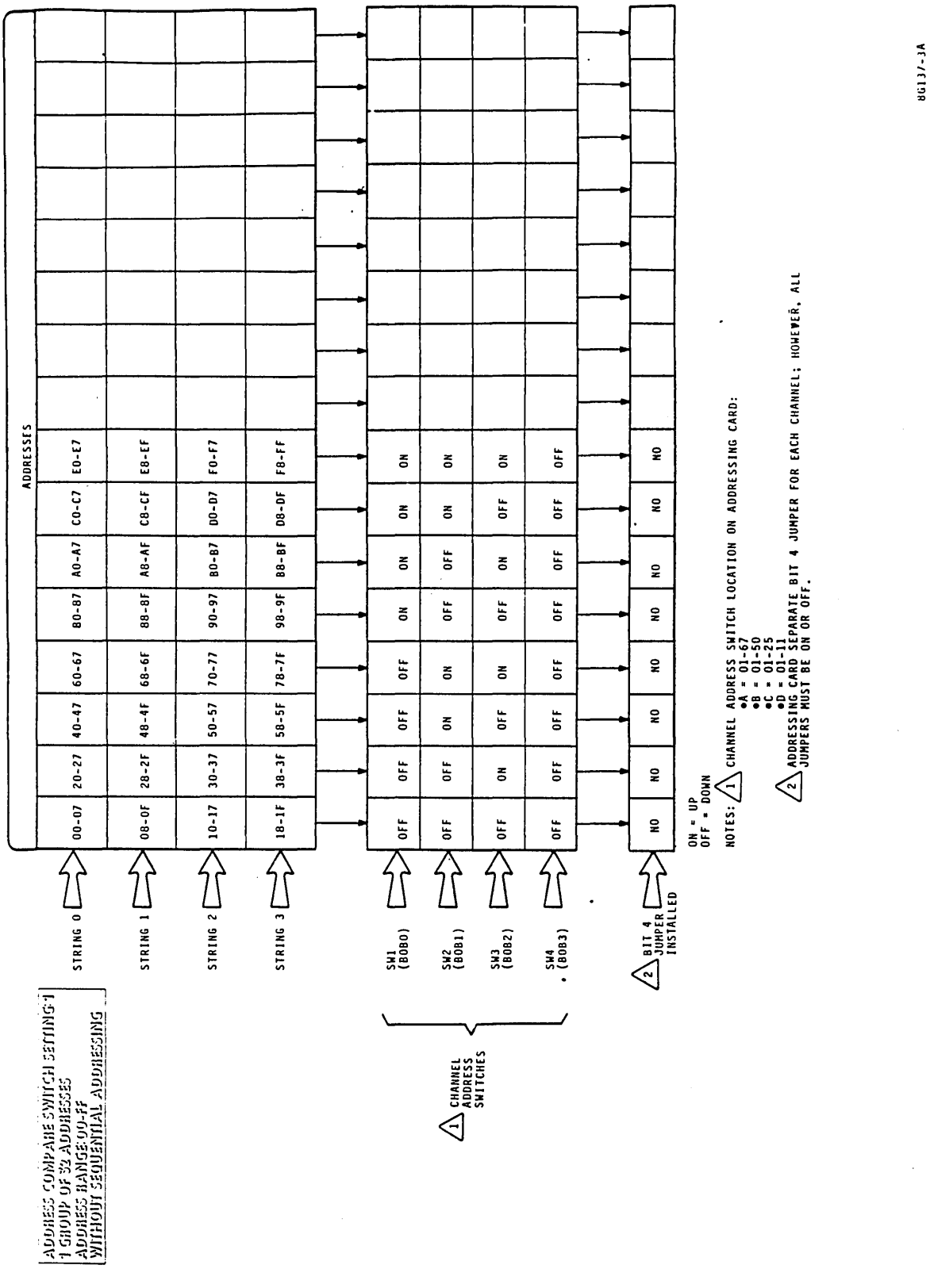


Figure A-1. Address Validation (Sheet 3)

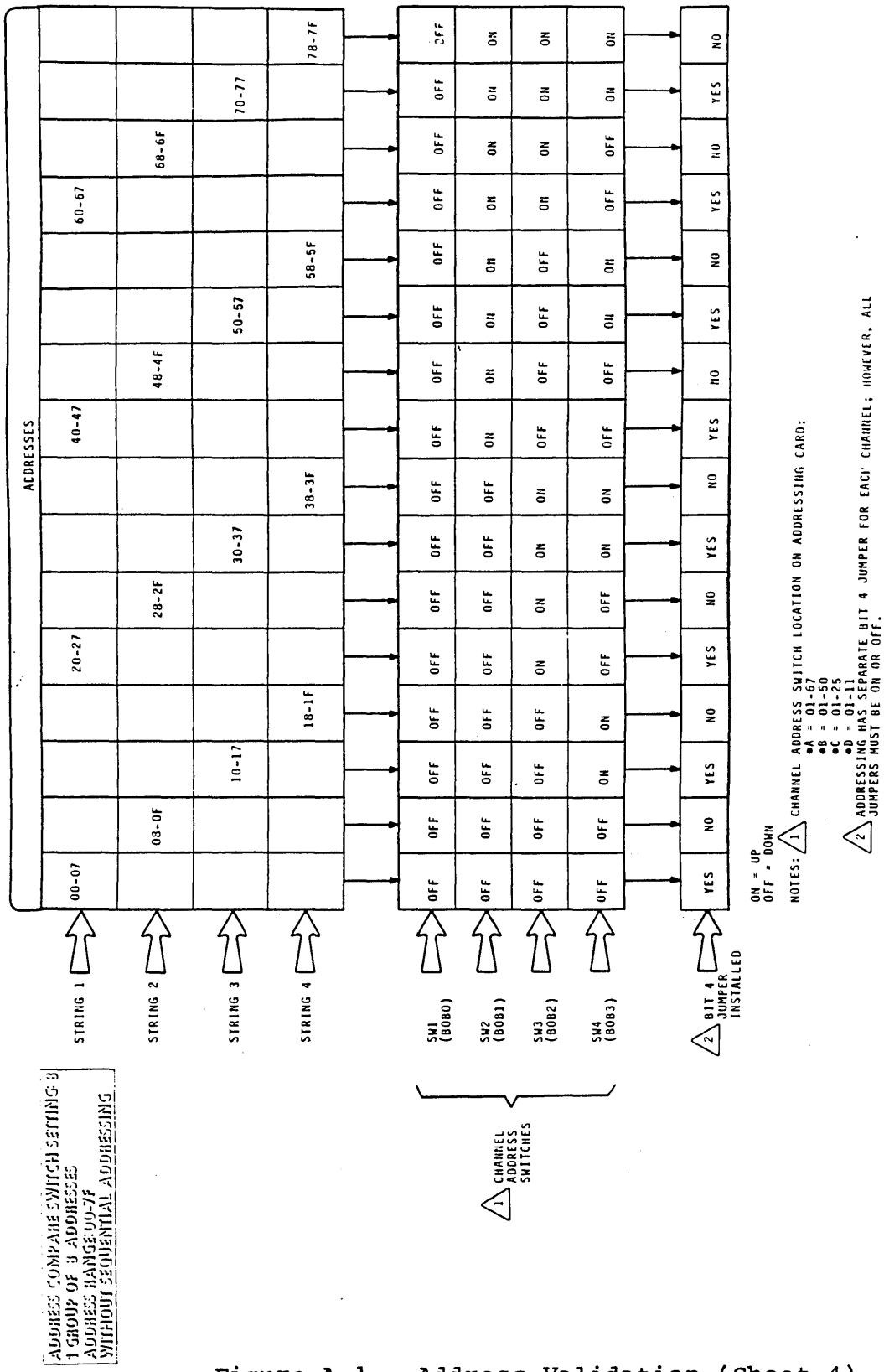


Figure A-1. Address Validation (Sheet 4)

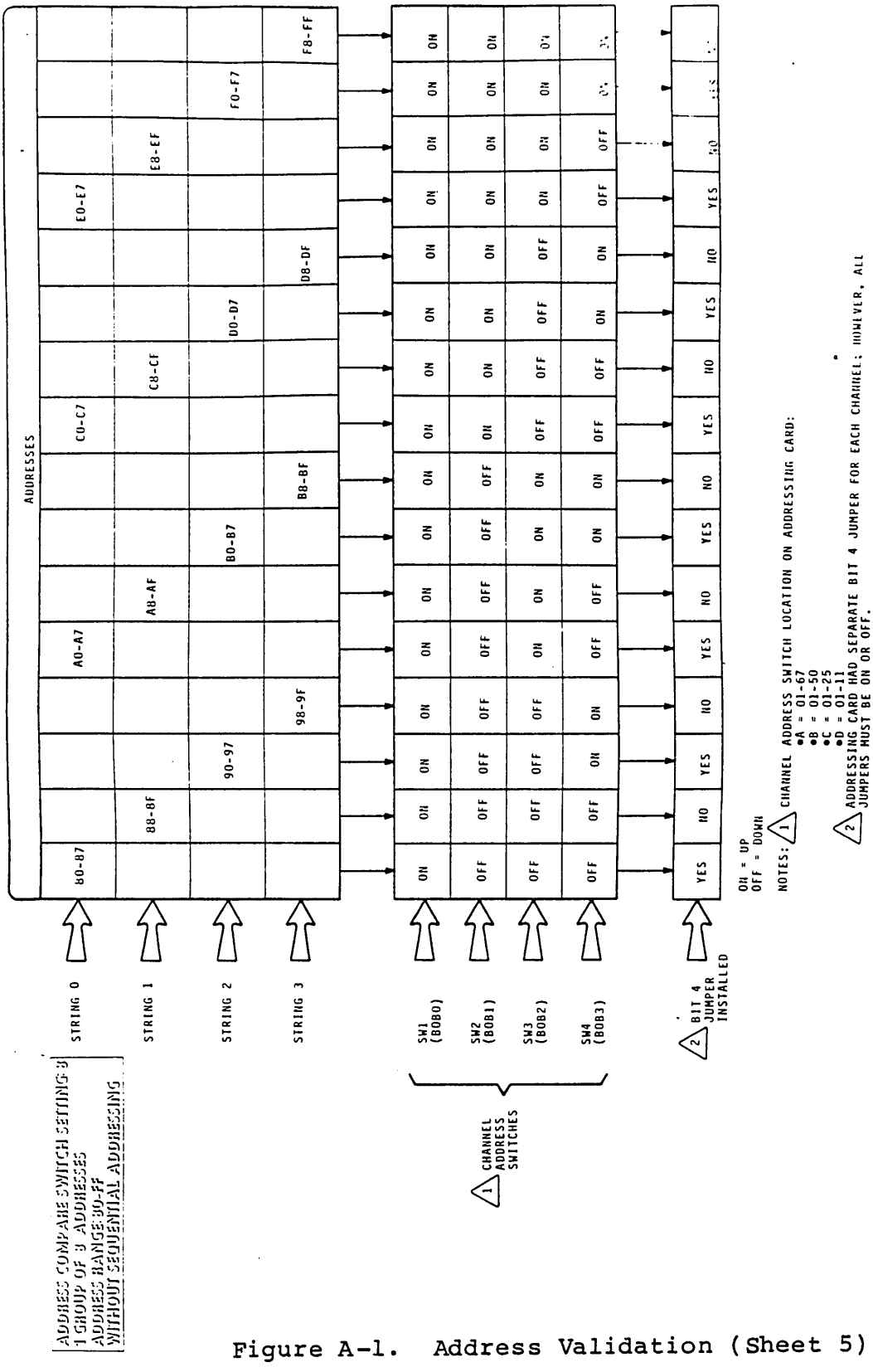


Figure A-1. Address Validation (Sheet 5)

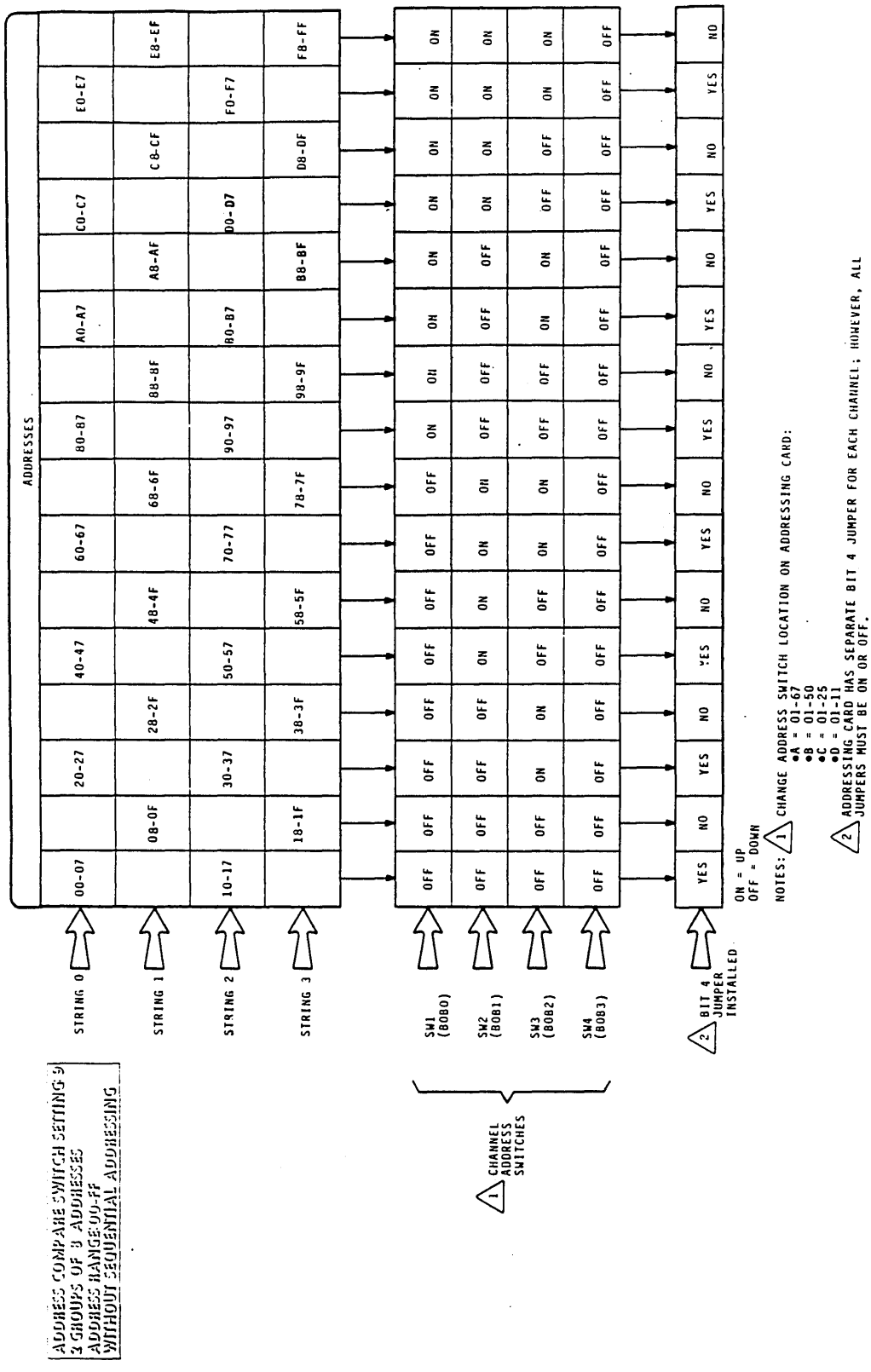


Figure A-1. Address Validation (Sheet 6)

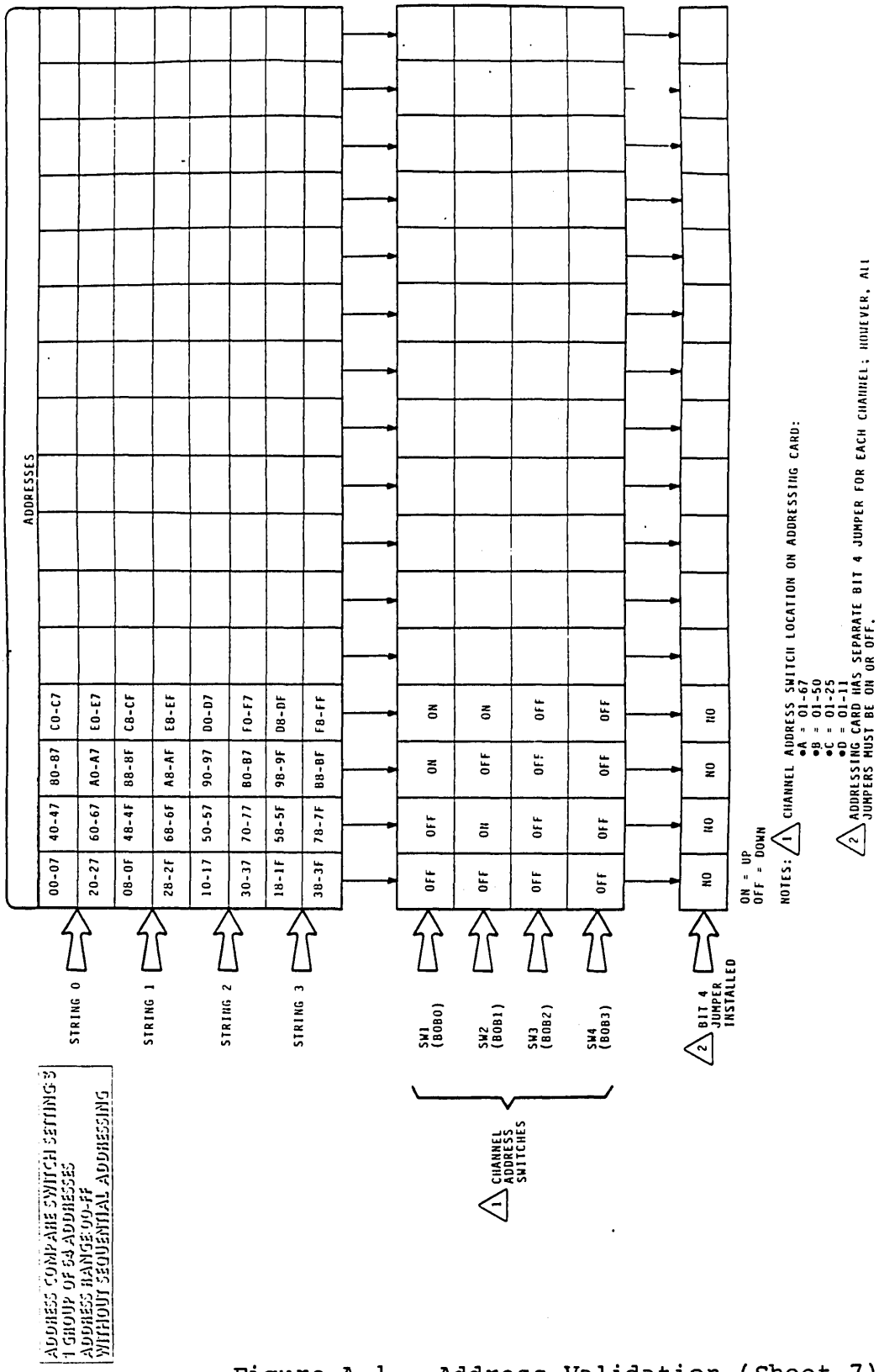


Figure A-1. Address Validation (Sheet 7)

ADDRESS COMPARE SWITCH SETTING A
2 GROUPS OF 8 ADDRESSES
ADDRESS RANGE 00-FF
WITHOUT SEQUENTIAL ADDRESSING

	ADDRESSES															
STRING 0	00-07				40-47				80-87				C0-C7			
	20-27				60-67				A0-A7				E0-E7			
STRING 1		08-0F				48-4F				88-8F				C8-CF		
		28-2F				68-6F				A8-AF				E8-EF		
STRING 2			10-17				50-57				90-97				D0-D7	
			30-37				70-77				B0-B7				F0-F7	
STRING 3				18-1F				58-5F				98-9F				D8-DF
				38-3F				78-7F				B8-BF				F7-FF
SW1 (B0B0)	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON
SW2 (B0B1)	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	ON	ON
SW3 (B0B2)	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
SW4 (B0B3)	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON
(2) BIT 4 JUMPER INSTALLED	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO

(1) CHANNEL ADDRESS SWITCHES: SW1–SW4

ON = UP
OFF = DOWN

NOTES: (1) CHANNEL ADDRESS SWITCH LOCATION ON ADDRESS CARD:
- •A = 01-67
- •B = 01-50
- •C = 01-25
- •D = 01-11

(2) ADDESSING CARD HAS SEPARATE BIT 4 JUMPER FOR EACH CHANNEL; HOWEVER, ALL JUMPERS MUST BE ON OR OFF.

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Figure A-1. Address Validation (Sheet 8)

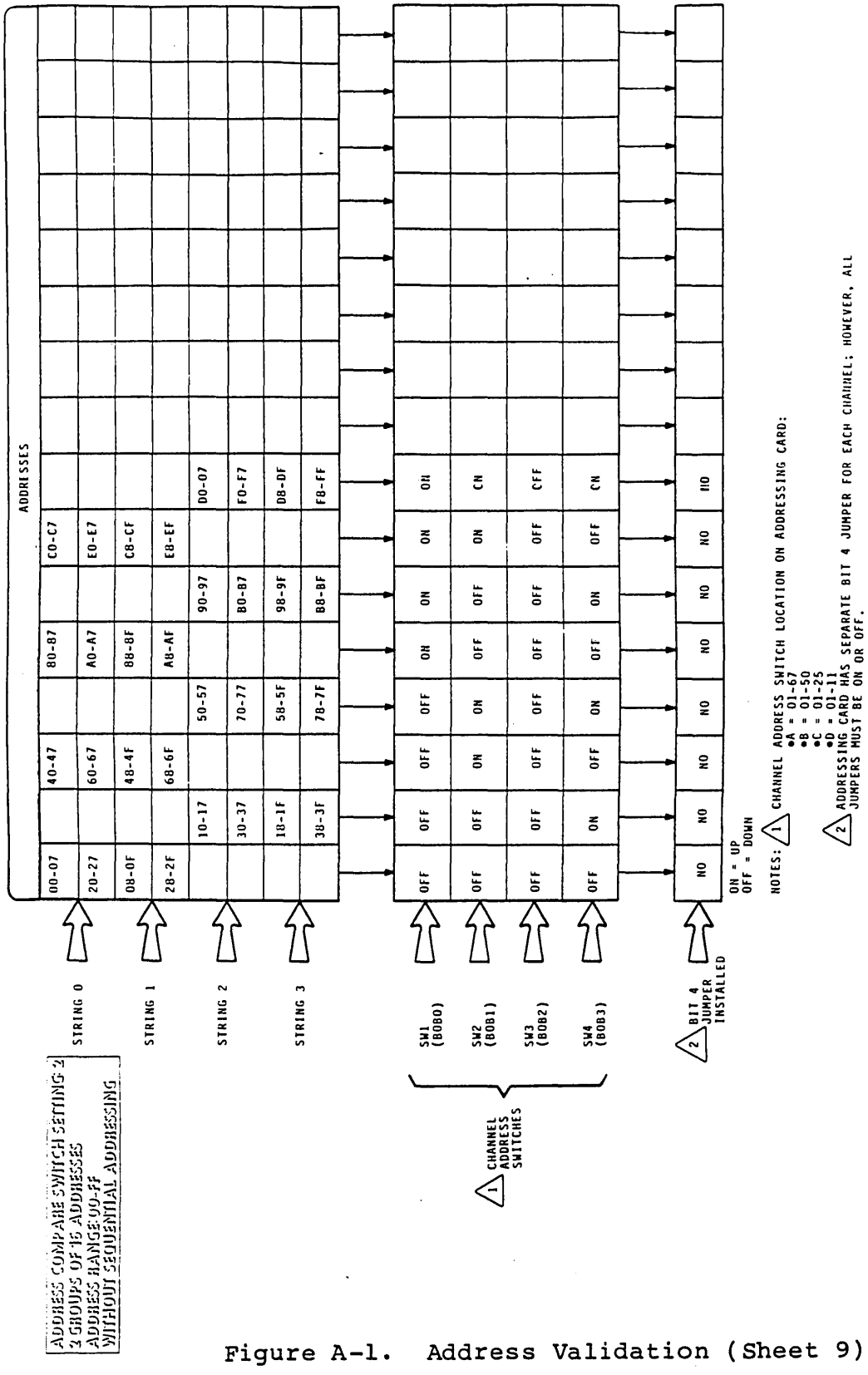

Figure A-1. Address Validation (Sheet 9)

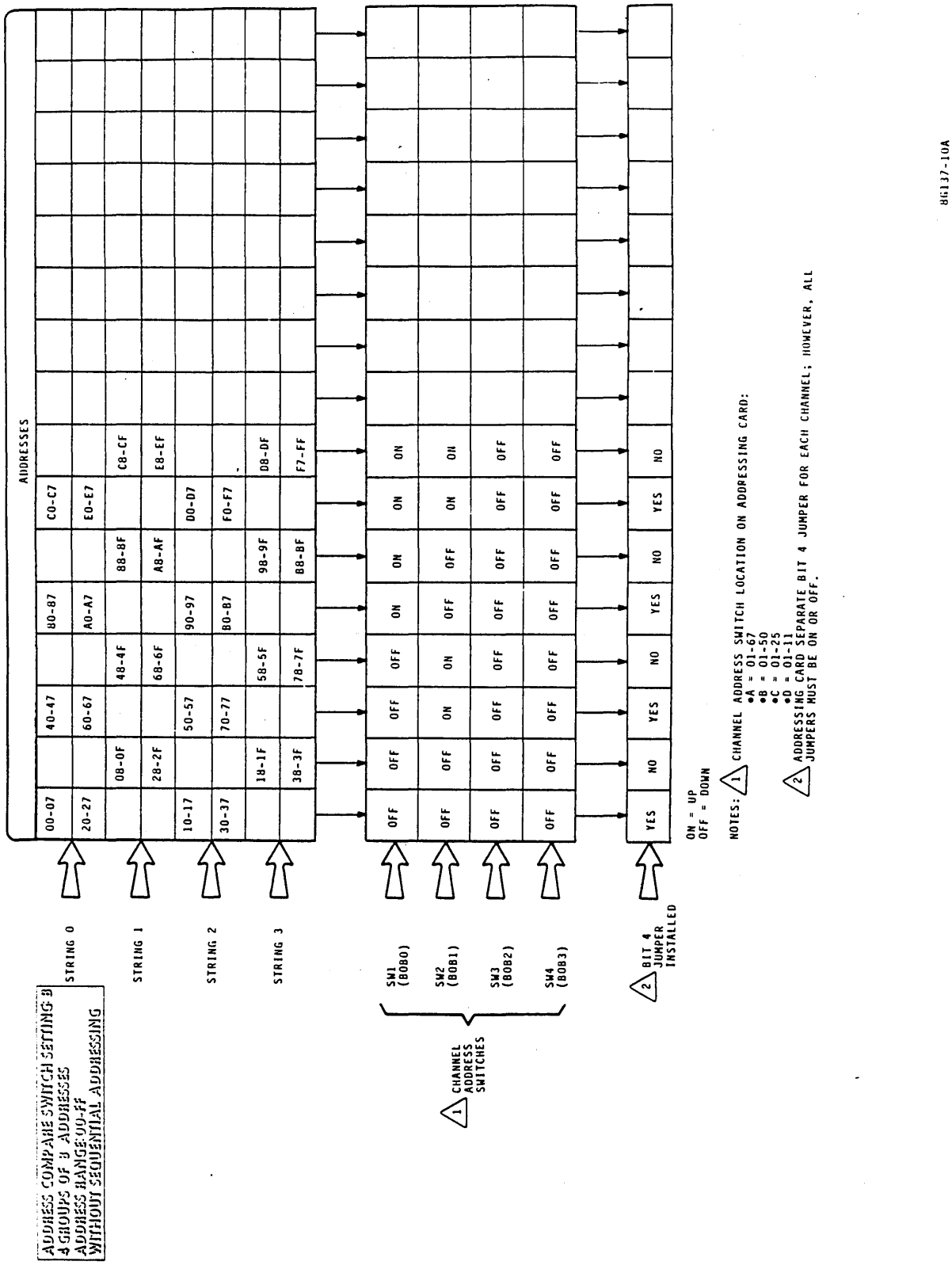

Figure A-1. Address Validation (Sheet 10)

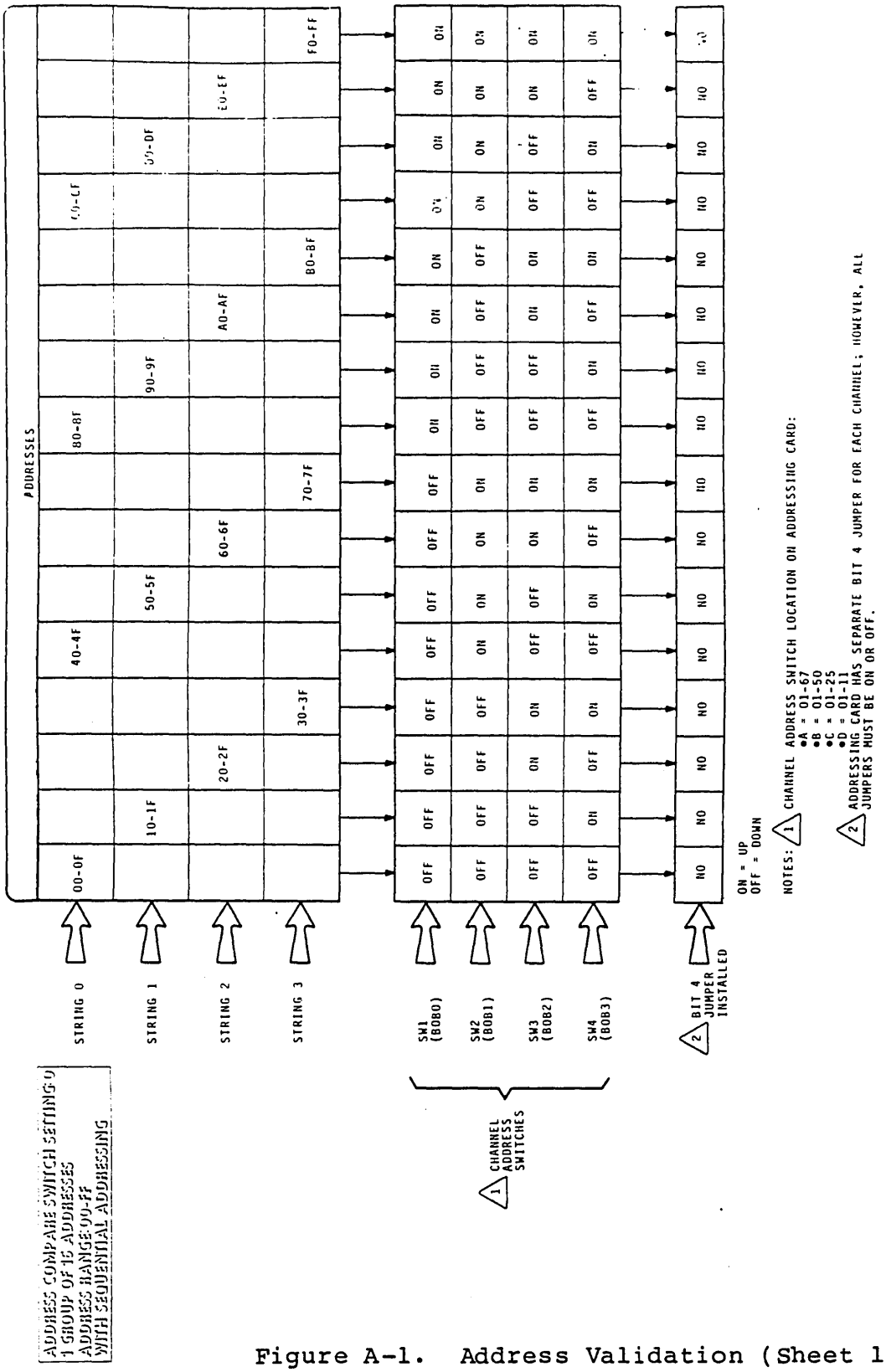

Figure A-1. Address Validation (Sheet 11)

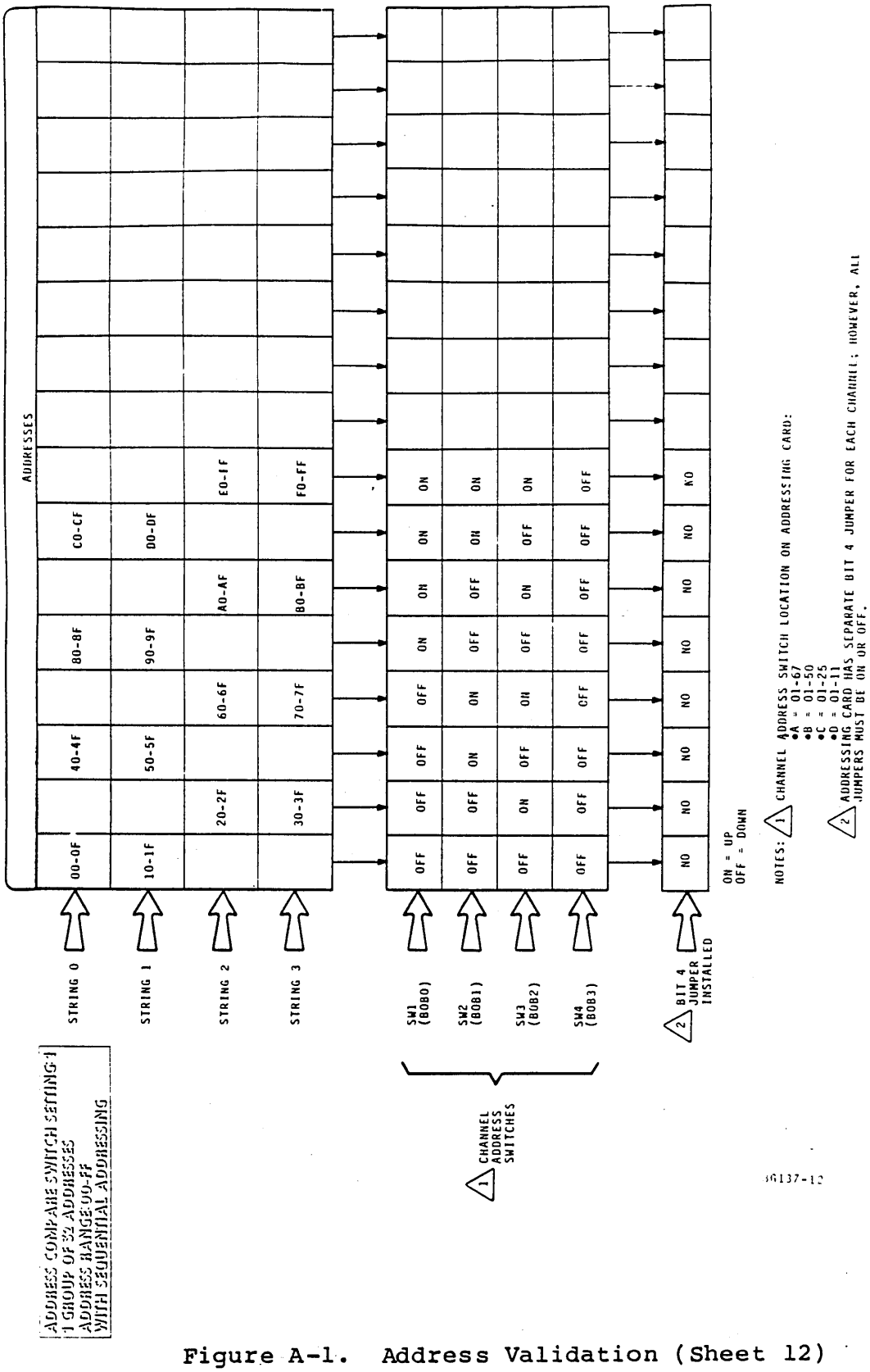

Figure A-1. Address Validation (Sheet 12)

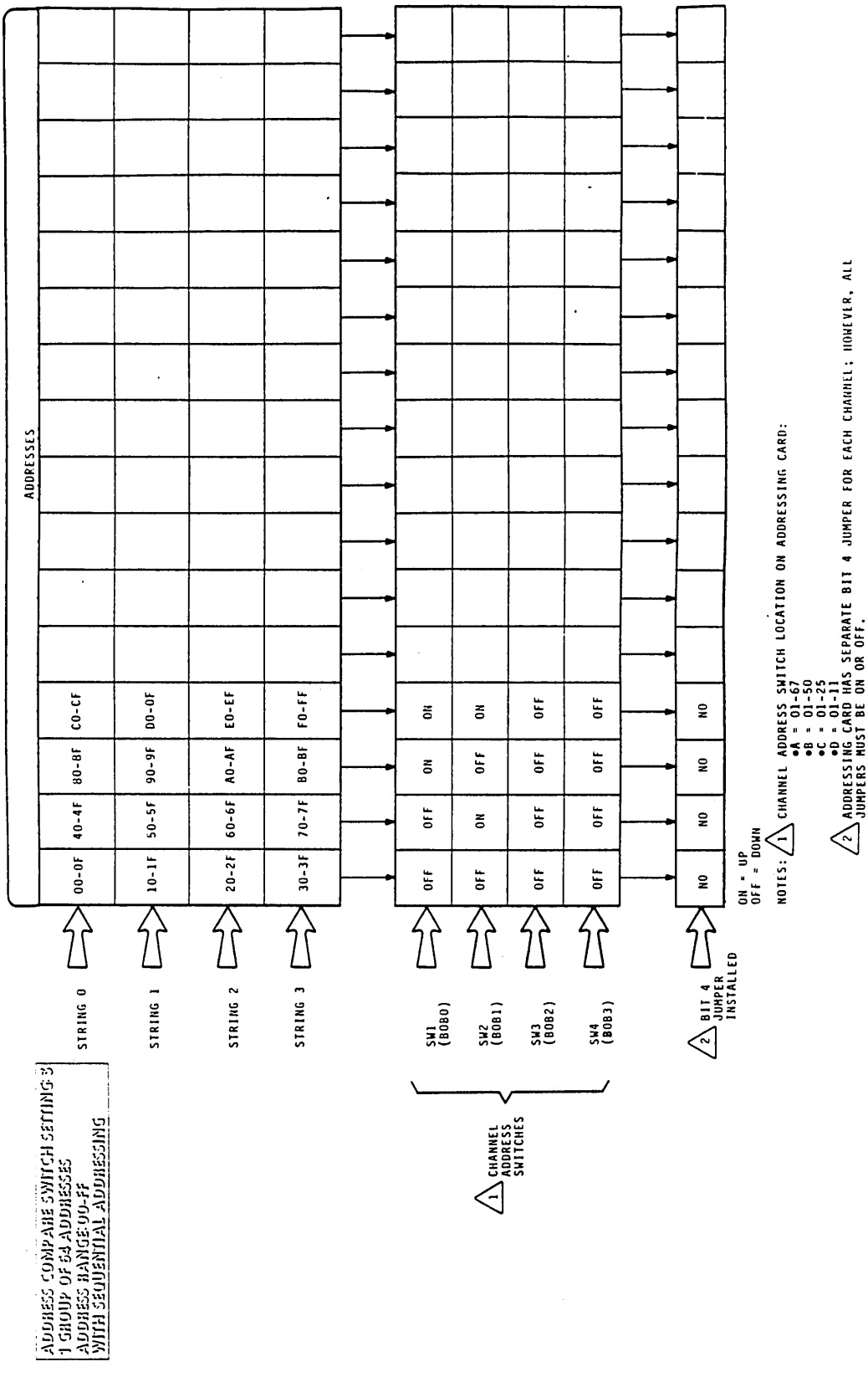

Figure A-1. Address Validation (Sheet 13)

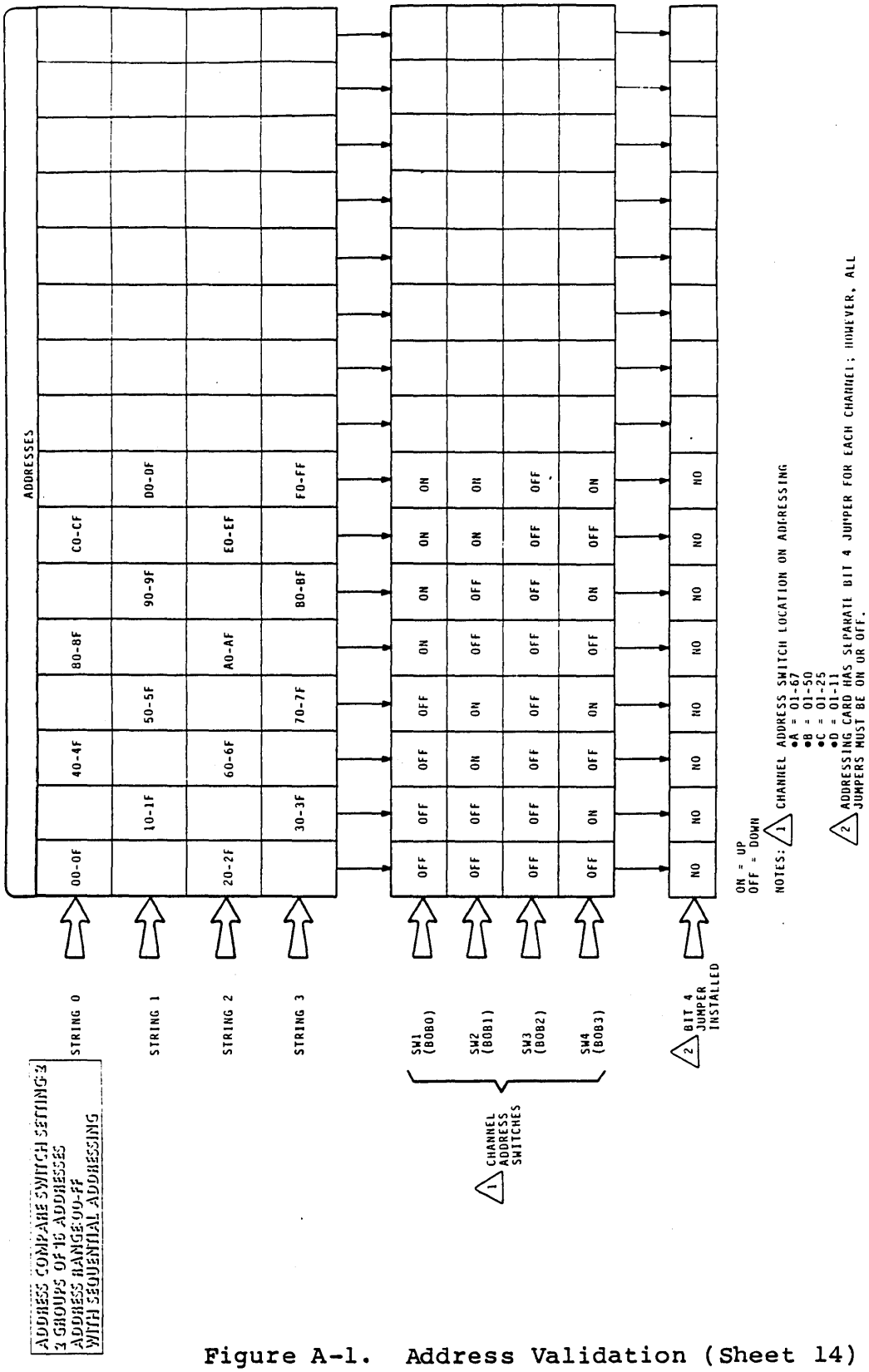

Figure A-1. Address Validation (Sheet 14)

ADDRESSING SCHEME EXAMPLES

WITHOUT SEQUENTIAL ADDRESSING

Here are examples using Steps 1 through 3.

Example 1

The customer has purchased a storage control, one full string of 33502 (2 x 3350) devices, one full string of 33801 (2 x 3330-11) devices, one full string of 33501 (1 x 3350) devices, and one full string of 33302 type devices. The total number of addresses required for this subsystem is as follows:

a. full physical string of 33502 =16 addresses
b. full physical string of 33801 =16 addresses
c. full physical string of 33501 = 8 addresses
d. full physical string of 33302 = 8 addresses

TOTAL: 48 Addresses

Glancing at sheet 1 of figure A-1, it can be determined that we must use one of the dual volume tables (sheets 7 through 10), and it must be a table with 48 or more addresses within each column. In addition, it must be a table that provides for up to four logical strings per column (one physical string equals one logical string when operating in 16-device DAF mode). Only sheet 7 (Address Compare switch = 3) qualifies. The available column addresses are: 00-3F, 40-7F, 80-BF, or C0-FF. Because each column provides a total of 64 addresses, and only 48 addresses are required, 15 addresses from the selected column are wasted and cannot be used elsewhere.

Example 2

The customer has purchased a storage control, one full string of 33502 (2 x 3350) devices, one full string of 33501 (1 x 3350) devices, and one full string of 33302 type devices. The total number of addresses required for this subsystem is as follows:

a. full physical string of 33502 =16 addresses
b. full physical string of 33501 = 8 addresses
c. full physical string of 3330-11 = 8 addresses

TOTAL: 32 Addresses

Checking sheet 1 of figure A-1, it can be determined that we must use one of the dual volume tables, and it must be a table

with 32 or more logical addresses within each column. It must also be a table that provides for three or more strings per column (one physical string equals one logical string when operating in 16-device DAF mode). In this instance, we can select only from sheet 7, which provides for up to four strings. A total of 32 addresses are wasted (16 secondary addresses from strings b and c as well as the full complement of 16 addresses for the nonexistent fourth string).

Example 3

The customer has purchased a storage control, one full string of 33502 (2 x 3350) devices, and one full string of 33801 (2 x 3330-11) devices. The total number of addresses required for this subsystem are as follows:

a. Full physical string of 33502 = 16 addresses
b. Full physical string of 33801 = 16 addresses

TOTAL = 32 Addresses

Checking sheet 1 of figure A-1, it can be determined that we must use one of the dual volume tables, and it must be a table with 32 or more addresses within each column. It must also be a table that provides for two or more logical strings per column (one physical string equals one logical string when operating in 16-device DAF mode). In this instance, we can select from sheet 7 (64 continguous addresses), sheet 10 (4 groups of 8 addresses), or sheet 9 (2 groups of 16 addresses). Selecting sheet 7 would be wasteful of addresses, but would provide some flexibility if additional units were to be added in the future. If future additions are not probable, the addresses should be chosen from sheet 9 or sheet 10.

WITH SEQUENTIAL ADDRESSING

Here are examples using Steps 1 through 3.

Example 1

The customer has purchased a storage control, one full string of 33502 (2 x 3350) devices, one full string of 33801 (2 x 3330-11) devices, one full string of 33501 (1 x 3350) devices,

and one full string of 33302 type devices. The total number of addresses required for this subsystem is as follows:

a. full physical string of 33502 =16 addresses
b. full physical string of 33801 =16 addresses
c. full physical string of 33501 = 8 addresses
d. full physical string of 33302 = 8 addresses

TOTAL: 48 Addresses

Glancing at sheet 1 of figure A-1, it can be determined that we must use a table with 48 or more addresses within each column. In addition, it must be a table that provides for up to four logical strings per column (one physical string equals one logical string when operating in 16-device DAF mode). Only sheet 13 (Address Compare switch = 3) qualifies. The available column addresses are: 00-3F, 40-7F, 80-BF, or C0-FF. Because each column provides a total of 64 addresses, and only 48 addresses are required, 15 addresses from the selected column are wasted and cannot be used elsewhere.

Example 2

The customer has purchased a storage control, one full string of 33502 (2 x 3350) devices, one full string of 33501 (1 x 3350) devices, and one full string of 33302 type devices. The total number of addresses required for this subsystem is as follows:

a. full physical string of 33502 =16 addresses
b. full physical string of 33501 = 8 addresses
c. full physical string of 3330-11 = 8 addresses

TOTAL: 32 Addresses

Checking sheet 1 of figure A-1, it can be determined that we must use a table with 32 or more logical addresses within each column. It must also be a table that provides for three or more strings per column (one physical string equals one logical string when operating in 16-device DAF mode). In this instance, we can select only from sheet 13, which provides for up to four strings. A total of 32 addresses are wasted (16 secondary addresses from strings b and c as well as the full complement of 16 addresses for the nonexistent fourth string).

Example 3

The customer has purchased a storage control, one full string of 33502 (2 x 3350) devices, and one full string of 33801 (2 x 3330-11) devices. The total number of addresses required for this subsystem are as follows:

a. Full physical string of 33502 = 16 addresses
b. Full physical string of 33801 = 16 addresses

TOTAL = 32 Addresses

Checking sheet 1 of figure A-1, it can be determined that we must use a table with 32 or more addresses within each column. It must also be a table that provides for two or more logical strings per column (one physical string equals one logical string when operating in 16-device DAF mode). In this instance, we can select from sheet 13 (64 continguous addresses) or sheet 14 (2 groups of 16 addresses). Selecting sheet 13 would be wasteful of addresses, but would provide some flexibility if additional units were to be added in the future. If future additions are not probable, the addresses should be chosen from sheet 14.

SWITCH SETTING EXAMPLES - NON-SEQUENTIAL ADDRESSING

EXAMPLE 1

Going back to example #1, assume the customer has requested an address range of 00-3F. Because we have set Address Compare to hexadecimal 3, we can determine that only bits 0 and 1 of the channel address will be significant in the storage control. In addition, because we have chosen addresses 00-3F, we can determine that these two bits must both decode as zeroes.

Enter hexadecimal 3 in the Address Compare switch. Set switch sections 1 and 2 (channel address bits 0 and 1) on the appropriate Channel Address switch to the OFF (down) position. Switch sections 3 and 4 (channel address bits 2 and 3) are ignored in the storage control but, as a precaution, they should be set to the OFF (down) position. Bit 4 of the channel address is also ignored in the storage control and should be left unjumpered.

Channel address bit 2 (Volume bit) is used at the device level to select a physical range of cylinders from decimal 00 through 420 (primary cylinders) or 421 to 841 (secondary cylinders).

The string and device address are defined by decoding bits 3 through 7 of the channel address. Bits 3 and 4 are decoded in

the A2/C2 controller logic (33801/3350X strings) or in the CAU (33301/33302 strings). Bits 5 through 7 are always associated with the device address.

EXAMPLE 2

Example #2 is translated in the same manner as example #1.

EXAMPLE 3

Example #3 is more complex. Assume the customer has selected 4 groups of 8 addresses (sheet 10) rather than 2 groups of 16 addresses (sheet 9). Let us also assume that the customer has then selected the leftmost column of addresses from the table. Selecting from this column forces us to define the addresses of the strings as 0 and 2. Within string 0 we have a range of primary addresses from 00 through 07 and a secondary range of addresses from 20 through 27. Within string 2 we have a range of primary addresses from 10 through 17 and a secondary range of addresses from 30 through 37.

The channel address bits used to decode the storage control are 0, 1, and 4. (The reason for this is because we selected "B" on the Address Compare switch.) We must, therefore, set switch sections 1 and 2 to the OFF (down) position. Switch sections 3 and 4 (channel address bits 2 and 3) are ignored in the storage control. Bit 4 of the channel address is significant and must be decoded as a zero. A jumper must be installed for the Bus Out Bit 4 decode on the channel being decoded.

In this instance, bit 4 is decoded in the storage control and also in the controller to form part of the string address.

All other bits are decoded in the same manner as that given in example #1.

SWITCH SETTING EXAMPLES - SEQUENTIAL ADDRESSING

EXAMPLE 1

Going back to example #1, assume the customer has requested an address range of 00-3F. Because we have set Address Compare to hexadecimal 3, we can determine that only bits 0 and 1 of the channel address will be significant in the storage control. In addition, because we have chosen addresses 00-3F, we can determine that these two bits must both decode as zeroes.

Enter hexadecimal 3 in the Address Compare switch. Set switch sections 1 and 2 (channel address bits 0 and 1) on the appro-

priate Channel Address switch to the OFF (down) position. Switch sections 3 and 4 (channel address bits 2 and 3) are ignored in the storage control but, as a precaution, they should be set to the OFF (down) position. Bit 4 of the channel address is also ignored in the storage control and should be left unjumpered.

Channel address bit 7 (Volume bit) is used at the device level to select a physical range of cylinders from decimal 00 through 420 (primary cylinders) or 421 to 841 (secondary cylinders).

The string and device address are defined by decoding bits 2 through 6 of the channel address. Bits 2 and 3 are decoded in the controller logic. Bits 4 through 6 are always associated with the device address.

EXAMPLE 2

Example #2 is translated in the same manner as example #1.

EXAMPLE 3

Example #3 is more complex. Assume the customer has selected 2 groups of 16 addresses (sheet 14). Let us also assume that the customer has then selected the leftmost column of addresses from the table. Selecting from this column forces us to define the addresses of the strings as 0 and 2. Within string 0 we have a range of primary addresses from 00 through 0F, where all even addresses are primary and all odd addresses are secondary. Within string 2 we have a range of primary addresses from 20 through 2F.

The channel address bits used to decode the storage control are 0, 1, and 3. (The reason for this is because we selected "2" on the Address Compare switch.) We must, therefore, set switch sections 1, 2, and 4 to the OFF (down) position. Switch section 3 (channel address bit 2) is ignored in the storage control.

All other bits are decoded in the same manner as that given in example #1.

COMMENT SHEET

MANUAL TITLE:

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COMPANY:_____

STREET ADDRESS:_____

CITY:_____ STATE:_____ ZIP CODE:_____

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